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ABSTRACT

This first of a two-part report describes a project designed to develop instruments and procedures for evaluating and assessing the status of vocational education facilities in Indiana. Chapter 1 of this report presents the goals of an Indiana project as follow: to develop, collect, and organize acceptable facility and fixed equipment criteria for vocational-technical programs in secondary schools in Indiana; to develop and test assessing instruments; to perform actual site inspections of a sample of vocational facilities in Indiana; to develop a cost analysis model for determining estimated costs of remodeling and/or new construction; and to develop a computer program to analyze the data from the building and site inspections. Chapter 2 describes the background information search conducted to determine guidelines for facility planning. Chapter 3 presents the procedures and results of the modified Delphi study which was undertaken to determine features of facilities for vocational education programs. The development of the assessment instruments and procedures are described in chapter 4, and the development of cost estimation models and computer programs are described in chapter 5. Chapter 6 discusses the field testing of the instrument and implications and uses of the packet. Finally, chapter 7 presents findings, conclusions, and recommendations. (BM)

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FINAL REPORT

INSTRUMENTS AND PROCEDURES

FOR

EVALUATING AND ASSESSING THE STATUS OF

VOCATIONAL EDUCATION FACILITIES IN INDIANA

VOLUME I

Prepared by

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July 1978

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CE 020 200

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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FOREWORD

The information contained in Volume I and Volume II of the final report of this project involved an expenditure of many resources. Time and effort given to this project by the advisory council and members of its evaluation committee particularly were considerable. The members of the internval advisory group had a major impact on the study. The cooperation of the administration and staff members of the various school corporations during on-site visitations of vocational facilities was essential to the completion of the project. Panelists also participated in the modified Delphi study added an important dimension to the study. Then, too, the many people (e.g., architects, state officials) who advised and reacted to the things being done on the project provided important input to the project. Finally, the project team and its staff worked very hard and tirelessly in planning and carrying out the many activities associated with a project of this magnitude. It is hoped that the human and material resources invested in this project will pay large dividends--dividends measured in improvement of facilities to accommodate vocational education programs adquately and efficiently.

Walter J. Penrod, Executive Officer
Indiana State Advisory Council
for Vocational Education

CHAPTER I

INTRODUCTION

With the growth of vocational-technical education in Indiana, there exists a need to determine what is an adequate educational facility for delivering these programs. Also, due to changing technology, there needs to be a method of assessing vocational facilities to meet the demands of these changes. One method of providing assistance to vocational leaders is an information system that will provide the necessary information on the present status of vocational facilities; the minimum acceptable criteria for site acceptability, accessibility, suitability, and development; and the minimum acceptable criteria for building construction components such as spatial, sonic, thermal, visual, hygienic, safety, traffic flow, equipment, and structural.

Any development of an information system for vocational decision makers should provide a means of assessing not only present facilities, but new construction as well as remodeling and renovation projects. Also, information on estimated costs of construction, remodeling, or renovation should be part of the system so that vocational leaders can make financial plans with local school officials; county, regional, or state agencies; and/or the federal government.

Statement of Problem

The specific problem that this project addressed was to develop, collect, and organize acceptable facility and fixed equipment criteria for vocational-technical programs in secondary schools in Indiana; to develop and test assessing instruments for assessing the present status of vocational facilities in Indiana; to perform actual site inspections on a sample of vocational facilities in Indiana; to develop a cost analysis model for determining estimated costs of remodeling, renovation, and/or additional new construction; and to develop a computer program to analyze the data collected from the building and site inspections.

Purpose and Objective

The major purpose of this project was to provide an assessment model for assessing the status of facilities and fixed equipment being used in Indiana for the delivery of vocational programs, including accommodation of these facilities to meet the needs of the physically handicapped. The primary objective of the project was to develop assessment tools, procedures, and techniques to be used to evaluate secondary vocational facilities and fixed equipment in the state. Major emphasis of this project was on the development, revision, and refinement of assessment instrumentation. Actual collection of building and site data was an essential part of the development process.

The specific objectives of this research project was as follows:

1. To develop and test an instrument to assess the status of existing facilities and fixed equipment, including on-campus and off-campus facility arrangements used to deliver vocational education programs
2. To develop compatibility of the instrument to existing data systems of the State of Indiana
3. To develop a formula for measuring the estimated unit cost of facilities to deliver vocational education programs, including a technique for estimating costs for possible future replacements, modifications, or improvements to meet changing demands
4. To assess the status of facilities and fixed equipment for vocational education in a sample of Indiana area vocational centers and comprehensive secondary schools
5. To determine the extent to which the facilities meet standards as approved by the Commission on General Education, Division of Vocational Education, etc.
   a) To determine the relationship between existing facilities and standards for approved facilities

b) To determine the extent to which existing facilities meet guidelines approved for accommodating physically handicapped students.

Significance of Study

> Lack of data and tangible evidence . . . make it difficult for laymen or professionals to fully evaluate the national program of vocational education.[1]

This statement was written in 1963 and it is equally true today. Many projects for development of Management Information Systems (MIS) have been funded by both state and federal agencies in the last five years to develop MIS for providing the necessary data to be used for vocational decision makers. This research project is an attempt by the Indiana State Advisory Council for Vocational Education to provide an organized facility and cost assessment instrument and procedures which will provide the necessary data for decision making on vocational facilities and fixed equipment. More specifically, the results of this project could be used to:

1. Assist in explaining differences in results by type of facility (e.g., area vocational center, comprehensive high school, etc.)

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[1] Lee, A. M., "Project Baseline: Histographic Foundations for Vocational Education Statistics," Educational Researcher, July-August 1977, 6 (7), 3.

2. Assist in developing planning strategies related to facilities and fixed equipment
3. Provide a systematic procedure for periodic studies of facilities and fixed equipment in the future
4. Determine the extent to which the facilities meet acceptable criteria of state agencies such as Commission on General Education and the Division of Vocational Education.

The current level of technology is causing vocational education to modify its programs and methods of teaching to meet changing demands. These changes are causing increasing demands on secondary vocational facilities and fixed equipment. Therefore, vocational education decision makers need to have some method of assessing the "What is?" as well as the "What should be?" in vocational facilities. Architect Howard Lane has summarized in two rules the above concerns. Rule one is "No one can afford to be inefficient anymore--in terms of dollars and cents, in terms of energy or in terms of technological obsolescence."[1] The second rule is " . . . nothing changes so fast as change itself. We cannot build schools that can only accommodate today's skills, but must concentrate on developing environments which can be easily adapted to a level of technology as yet unknown."[2]

---

[1] Howard Lane as quoted in "Architect Melds Present and Future needs in Design of Flexible Vocational Training Center," CEFP Journal, March-April 1978, 16 (2), . . .

[2] ibid.

This research project is an attempt to provide information to vocational leaders in helping them plan vocational facilities that will meet these demands caused by changing technology.

Project Strategies

The procedures used by the research staff for this project are described in Appendix I. Figure I-1 is a detailed flow chart which shows the sequence of the major project events. Table I-1 is the description of each major task listed on the flow chart with the staff assignments. The person whose identification number is in parentheses had primary responsibility for that task.

Detailed explanations of these major components are explained in the various chapters of this report. Chapter II covers the guidelines for facility planning as described in the literature survey. Chapter III discusses the modified Delphi study. The development of facility assessment instruments and procedures are presented in Chapter IV.

Chapter V presents the cost formula and the nature and use of the computer programs. Chapter VI discusses the on-site visitations, the site sample selection procedures, and the use of facility assessment reports. Chapter VII will report the findings, conclusions, and recommendations. Products of this research project, which are the Instruction Manual: Building/Site Assessment Packet for Vocational Education Facilities, the Instruction Manual: Cost

Formula, the Instruction Manual: Data Processing Programs, and the Building/Site Assessment Report, and the Select Bibliography for Vocational Education Facilities, are included in Volume II (Appendices).

CHAPTER II

GUIDELINES FOR FACILITY PLANNING

It is important when developing instruments and techniques for use in assessing vocational facilities to generate background information that is comprehensive and encompassing to use in planning. The literature needs to be searched extensively. Official agencies need to be contacted to secure guidelines, regulations, and other information used by these agencies. In addition, information needs to be solicited from different professional associations and groups. This chapter highlights the guidelines for facility planning.

Purposes of Background Information Search

In order to develop the Modified Delphi Instrument and the School Building/Site Assessment Packet for assessing vocation education facilities, it was necessary to conduct national and state surveys of departments of public instruction, state boards of vocational-technical education, professional associations concerned with facilities planning and/or vocational education, and a review of any guidelines for vocational facilities that was developed by public agencies in Indiana. The purposes of this phase of the project were as follows:

1. To determine what facility guidelines have been established in other states
2. To establish an information bank on vocational facility planning materials
3. To determine the state-of-the-art on vocational facilities assessment procedures
4. To determine the procedures for cost estimation of remodeling, renovation, and/or new construction of vocational facilities
5. To provide sample items for the Delphi questionnaire
6. To provide items for the School Building/Site Assessment Packet survey instruments.

National Survey

A letter was sent to departments of public instruction and to state boards of vocational-technical education and/or vocational education (see Appendix II-1). Representation of these groups were asked to provide any documentation that they may have had concerning design, standards, and method of assessing vocational education facilities. Appendix II-2 and Appendix II-3 contain the list of professional associations contacted and the list of information received in annotated bibliographic form.

Letters were sent to 50 states and information was received as listed in the bibliographies. Fifteen professional associations were also contacted. After

receiving the materials sent from this survey, the project staff classified each item with a single "*" if it concerned facility standards or guidelines and a double "**" if it concerned evaluation of facilities. No information was received on cost estimation for remodeling or renovation of vocational facilities.

All materials received were reviewed for questionnaire items that would be applicable to the Modified Delphi Instrument and the School Building/Site Assessment Packet. Also, an analysis was conducted to establish some consensus on vocational facility guidelines or standards used or recommended by other states. Items for which consensus was indicated became the statements used in the Delphi process.

Indiana's Vocational Facilities Guidelines

The following state agencies were contacted for information on vocational education facilities:

1. State Board of Vocational/Technical Education
2. State Advisory Council for Vocational Education
3. Indiana Commission for Higher Education
4. Division of Vocational Education - Department of Public Instruction
5. Division of School-House Planning - Department of Public Instruction
6. Indiana Commission on General Education
7. Administrative Building Council of Indiana

8. Indiana State Fire Marshall's Office
9. Indiana Department of Health

Information was obtained from the following publications:

1. Administrative Construction Rules and Regulations Volume V, 1967
2. Draft copy of "Offical Rules, Regulations, and Policies Adopted and Promulgated by the Commission of General Education of the Indiana State Board on Education - Rule B-1"

These publications contained information on health and safety standards and on minimum room sizes of classrooms and laboratories for secondary schools.

The Division of Vocational Education of the Department of Public Instruction is currently developing a manual entitled Functional Space Planning Guide for Vocational-Technical Education Programs in Secondary Schools. A prepublication draft of this manual was obtained by the project, and it was used to identify acceptable criteria for vocational facilities and fixed equipment.

Literature Review

A comprehensive literature search was conducted to assist the project's research staff in developing the needed guidelines for facilities, procedures, and methods of facility assessment, as well as for the cost estimation for remodeling, renovation, and new construction. This search

consisted of a review of books, periodicals, and other information from organizations such as the Council of Educational Facility Planners, International. A computerized search was conducted on the ERIC system of the "ED" and "EJ" numbers.

All of the above information was reviewed and the publications determined by the projects staff to be the most beneficial were placed in an annotated bibliography under the following headings:

1. Special Education - Barrier Free Construction
2. Evaluation and Standards of Vocational Facilities: National Survey
3. School Facilities Evaluation Instruments: Literature Review
4. Cost Estimation Procedures for Remodeling, Renovation, and New Construction

Each of these sections contains a brief introduction and an annotated listing of the selected materials. As indicated in Chapter I, a Select Bibliography for Vocational Education Facilities, is included in Volume II (Appendices) from this project's research efforts.

Special Education - Barrier Free Construction

Section 504 of the Rehabilitation Act of 1973 guarantees the rights of all handicapped individuals who work or receive services at institutions receiving federal support. Considerable attention has been given to the need to make public buildings and facilities accessible to the entire

population, including the disabled and handicapped. Primary emphasis has been placed on providing accessibility to the physically handicapped, including most notably those confined to wheelchairs or exhibiting other ambulatory problems. Accessibility standards, however, relate to disabilities associated with other types of temporary, as well as more permanent, handicapping conditions.

Since 1961, standards of accessibility have existed. Again in 1971 the recognized standards, promulgated by the American National Standards Institute (ANSI), were reaffirmed. These standards represent the core of architectural consideration in both original design and remodeling efforts. The following bibliography includes publications which are based primarily on the ANSI standards. In addition, an extensive international bibliography is available. This list chronicles entries from around the world regarding transportation accessibility, building accessibility, and community accessibility.

Selected Annotated Bibliography

1. Access Chicago: Architects' and Designers' Handbook of Barrier-Free Design. The Rehabilitation Institute of Chicago. Chicago, IL.

   This 10 page pamphlet provides diagrams and measurements of: the wheelchair, doorways, stairs, ramps, elevators, restrooms, telephones, parking, and other special information. These are the basic elements of barrier-free design illustrated for use by planners. Copies available for purchase from: Access Chicago, Rehabilitation Institute of Chicago, 345 East Superior, Chicago, IL 60611. (Prices available on request for orders of more than five copies.)

2. A Handbook on the Legal Rights of Handicapped People. President's Committee on Employment of the Handicapped. (Washington, D.C., 1976).

   Federal laws specific to the handicapped in the areas of architectural barriers, benefits, civil rights, education, employment, hospital and medical matters, housing, insurance, transportaton, vocational rehabilitation, and lawyers and organizations for the handicapped are included. Laws were selected on the basis of their overriding importance in spelling out rights of individuals. The section on architectural barriers was relevant to our purposes. Specific laws are available from: House and Senate Document Room, U.S. Capitol, Washington, D.C. or Office of any U.S. Representative, or any Law Library.

3. Barrier Free Design-Accessibility for the Handicapped. Phyllis Tica and Julius A. Shaw, Institute for Research and Development in Occupational Education, Center for Advanced Studies and Education, The Graduate School and University of New York, 1411 Broadway, New York, NY 10010.

4. Barrier Free Design: Report of a United Nations Export Group Meeting. Susan Hammerman and Barbara Duncan, Rehabilitation International. (New York, 1974).

   This 38 page booklet outlines barrier free concerns on an international basis. The state of accessibility in housing, transportation, public buildings, and other environments as it exists in 14 different countries is summarized. It is not directly relevant to building design features, but does contain some good general information about barrier free concepts.

5. First Report to the Congress of the United States, Architectural and Transportation Barriers Compliance Board. U.S. Department of Health, Education, and Welfare. (Washington, D.C., 1974).

   This 168 page document contains legislative mandates and reports of various governmental agencies to the Congressional Compliance Board. Specific laws and regulations relative to architecture and transportation in government programs and facilities are included. American National Standards Institute standards are included as well as Federal Property Management Regulations.

6. Design and Construction of Buildings Financed with Federal Funds. Department of Health, Education, and Welfare Social and Rehabilitation Services Administration. (U.S. Government Printing Office, Washington, D.C., 1969).

   A single sheet, triple folded brochure describing Public Law 90-480, which applies to "public buildings" and facilities intended for use by the public and to those in which a physically handicapped person might live or be employed. A brief list of some important specifications is included. State Vocational Rehabilitation Agencies and Regional offices with addresses are listed.

7. Into the Mainstream: A Syllabus for a Barrier-Free Environment. Stephen A. Kliment. The American Institute of Architects and the Rehabilitation Services Administration, HEW (Washington, D.C., 1976).

   This is an extremely useful source. It provides an account of U.S. history of accessibility and a review of recent legislation; a description of the basic barrier conditions, both physical and procedural; suggested solutions to the removal of barriers, including illustrations plus techniques for evaluating compliance with applicable federal, state, and local laws and regulations. Also included are supplementary sources of information, including design guides, legal and legislative codes, ordinances and regulations, compliance and advocacy, product design, and others. (Includes a sample questionnaire for use in evaluating accessibility of buildings.)

8. Manual on Barrier Free Design. American Institute of Architects.

   Information is provided on what is entailed in barrier free designs. This manual is available through the state chapter of the A.I.A.

9. People are Asking About The National Easter Seal Society for Crippled Children and Adults (Chicago, IL)

   This 12 page pamphlet describes the use of accessibility symbols as detailed in the ANSI Standards (A 117.1-1961 R1971). A description of what the access symbol means, what the criteria for its use are, its use inside of buildings, its use outside of buildings and restrooms, and a requirements checklist for specific public buildings are included.

10. A Review of the Architectural Barriers Act of 1968, as amended, P. L. 90-480, General Accounting Office, Distribution Section, Room 4522, 441 G Street, N.W., Washington, D.C. 20037.

11. Specifications for Making Buildings and Facilities Accessible to, and Usable by, the Physically Handicapped. ANSI A117.1 - 1961 (R1971). American National Standards Institute, Inc. (New York, 1961).

    This is an 11 page booklet with specific standards for all buildings and facilities used by the public. ANSI standards apply to temporary or emergency conditions as well as to permanent conditions. It includes standards regarding non-ambulatory, semi-ambulatory, sight, hearing, uncoordination, and aging disabilities. Specifications relate to wheelchairs and wheelchair functioning, site development, ramps and walks, parking lots, buildings, entrances, doorways, doors, stairs, floors, toilet rooms, water fountains, public telephones, elevators and controls, identification symbols and warning signals, and hazards.

12. Survey of State Laws to Remove Barriers, President's Committee on Employment of the Handicapped. (Washington, D.C., 1973).

    This survey cites legislation, whether it pertains to public buildings or private, the responsibility for enforcement and whether there are sanctions for non-compliance. It is unpaged and in table format.

13. Technical Handbook for Facilities, Engineering and Construction Manual, "Part IV, Facilities Design and Construction, 4.00 Architectural, Section 4.2: Design of Barrier Free Facilities."

    This technical manual is available through Health, Education, and Welfare (HEW). (Washington, D.C.)

Evaluation and Standards of Vocational Facilities: National Survey

This survey requested standards for Vocational Education facilities from all 50 state departments of education and from 15 associations representing architects, engineers, facility planners, and vocational educators. At the

time of this writing, responses have been received from a total of 20 sources. The most useful publications were listed in the annotated bibliography.

The importance of adequate facilities to the success of modern vocational education programs is widely recognized. Attempts have been made to develop comprehensive standards in several states, but the problem of obsolescence seems to be a widespread and continuing one. Several states indicated that revisions were under way and that their current standards were, at least in part, outdated. California has discontinued the publication of detailed specific requirements in favor of more general guidelines because of the rapidly changing nature of vocational education. Several respondents expressed their concern for the lack of explicit standards for vocational facilities and recognized the need for an up-to-date evaluation tool for assessing facility adequacy. Requests have been received for copies of the results of this study from several states.

Of the six vocational clusters involved, standards for facilities are most fully developed in the trade-industrial education program area. Many states have quite extensive lists of recommendations and guidelines for industrial shops and laboratories. The other cluster areas seem to be less stabilized with respect to facility requirements. This is especially true in the emerging areas of vocational education.

The following selected annotated bibliography of materials received in the national survey and literature review suggest the status of vocational facilities that are in use in this country. Of particular value to this study were the publications from New Jersey, West Virginia, South Carolina, and Kentucky.

Selected Annotated Bibliography

1. Guidelines and Space Requirements for the Groton Regional Vocational-Technical School. Connecticut State Department of Education. (Hartford, CT, 1972).

   This publication outlines the specific facility requirements for the Groton School. Included are specifications for auto shops, small engines, carpentry, industrial education, heating and process piping, electricity, welding, machine shop, drafting, blue print, food trades, and health services. Each program is described and the facilities needed to implement the programs are specified. Copies are available from: Connecticut State Department of Education, Platt RVTS, 600 Orange Avenue, Milford, CT 06460.

2. Handbook on Planning School Facilities. West Virginia Department of Education. (Charleston, WV, 1973).

   This publication provides procedures and guidelines for planning school facilities in West Virginia. There is an excellent section on vocational facilities, especially with reference to industrial laboratories. Standards include square footage requirements and "special facility requirements" such as utility service needs. Labs are classified by per pupil space needs and special requirements are coded for each lab. Copies are available from: West Virginia Department of Education, Charleston, WV 25305.

3. Instruments and Procedures for the Evaluation of Vocational/Technical Education. National Study for Accreditation of Vocational/Technical Education. American Vocational Association. (Washington, DC, 1971).

   This is the pilot test edition of an evaluation guide similar to the North Central format. It contains

sections on all general areas of the vocational programs such as philosophy, needs assessment, organization, curriculum, and resources. Also it includes a section on facilities. Statements relative to facilities are general in nature and require subjective judgments in evaluation. Copies are available from: American Vocational Association, 1510 H Street, N.W., Washington, DC 20005.

4. Manual for Planning and Construction of School Buildings. State Department of Education. (Concord, NH, 1975).

   This publication is a general guide to school construction which provides some specific space recommendations for vocational areas. It includes home economics, shops, agriculture, business education, distributive education, office occupations, food service, and health occupations. Copies are available from: State Department of Education, Division of Vocational-Technical Education, 105 Loudon Road, Concord, NH 03301.

5. Planning and Equipping Industrial Arts Facilities. California State Department of Education. (Sacramento, CA, 1971).

   This publication provides educational specifications and suggested floor plans for auto mechanics, drafting, electricity, electronics, graphic arts, industrial crafts, metals, photography, plastics, power mechanics, woods, and general industrial arts. Also equipment lists are provided. Copies are available from: State Director of Vocational Education, California Department of Education, 721 Capital Mall, Sacramento, CA 95814.

6. Planning Occupational Education Facilities. Michigan Department of Education. (Lansing, MI, 1971).

   Guidelines are provided for vocational facilities in the areas of square footage, acoustical design, illumination, atmosphere control, service systems, and safety. It categorizes instructional areas as classroom, light lab, medium lab, heavy lab, and extra heavy lab, and it differentiates between facility needs on the basis of this classification. A rather extensive bibliography is included. Copies are available from: Michigan Department of Education, Vocational-Technical Education Service, Box 20009, Lansing, MI 48909.

7. Places and Spaces for Learning. South Carolina Department of Education. (Columbia, SC).

   This publication provides suggestions for square footage and other facility standards for the following areas: office occupations, health occupations, distributive education, home economics, trade and industrial, agriculture, and the vocational administration area. Copies are available from: South Carolina Department of Education, Columbia, SC.

8. Program Analysis Questionnaire for Vocational and Technical Education. Rhode Island Department of Education. (Providence, RI, 1971).

   This questionnaire covers areas of administration and guidance, curriculum, physical facilities, instruction, and cooperative education and describes evaluation procedures and composition of the evaluation team. The section on facilities provides a checklist of standards applicable to the general area of vocational education. Most statements require subjective judgment. Copies are available from: Rhode Island Department of Education, Hayes Street, Providence, RI 02908.

9. State Plan for Construction of Vocational Education Facilities. Kentucky State Department of Education. (Frankfort, KY, 1976).

   Criteria for establishing vocational facilities are provided, including square footage and other requirements in the areas of agriculture, business, distributive education, health occupations, home economics, trade and industrial, and cooperative education. Copies are available from: Kentucky Department of Education, Frankfort, KY 40601.

10. Vocational-Technical Facility Planning Guide. New Jersey Department of Education. (Trenton, NJ, 1976).

    This comprehensive guide for planning vocational facilities includes general discussions of planning with respect to curriculum, types of facilities, advisory committees, needs assessment, educational specifications, architect selection, site selection, and building design.

    Planning guidelines are provided for agriculture, business and office occupations, distributive education, health occupations, home economics, industrial arts, and vocational-technical. Each section includes association diagrams, utility requirements, special

feature, and equipment requirements. Square footage standards are not provided due to the diversity of program types and varying needs. Copies are available from: Director of School Planning Services, New Jersey Department of Education, 225 West State Street, Trenton, NJ 08625.

School Facilities Evaluation Instruments: Literature Review

A search was made to find instruments for use in evaluating school facilities. At the same time, the literature was surveyed to find suggested standards which would be considered as adequate for these facilities. Many of the instruments were very general in nature; few were directly applicable to vocational type buildings and sites. Several publications providing standards also were reviewed, and some of them did list rather specific data relating to facilities.

Selected Annotated Bibliography

1. Program Analysis Questionnaire for Vocational and Technical Education. Rhode Island Department of Education. March, 1971.

   This questionnaire presents criteria to be used in the evaluation of all aspects of vocational programs. Section III of the pamphlet is devoted to physical facilities. It contains five different check lists: adequacy of buildings, layout and floor plan, power and ventilation, tools and equipment, and safety.

2. Modern School Shop Planning. Prakken Publications, Inc. Seventh Edition. (Ann Arbor, MI: Prakken Publications, Inc., 416 Longshore Drive), 1976. 314 pages.

   Extensive and detailed information is given on planning and equipping school shops. The book has 15 sections which include details on different types of shops, e.g., general shop, automotive/power, graphic arts. In addition, planning, technical training, equipment and materials, and purchasing considerations are covered.

3. Educational Facilities Evaluation Guide. J. J. Resnick. (LaMirada, CA: Educational Planning Consultant), 1969. 82 pages.

   This guide is an extensive instrument that may be used to evaluate ten design factors ranging from the site to selected stations, e.g., food service, science, vocational and technical. A scoring procedure is presented.

4. "A Program to Evaluate Secondary Educational Facilities," Rudy J. Bauer. Educational Economics, February 1977. pp. 8-13.

   The article describes the Lincoln Public Schools' Facilities Evaluation Program. Major criteria for evaluation, site, building, and instructional adequacy are discussed for secondary schools. A point plan for scoring is explained. No details specifically for vocational facilities are presented.

5. School Site Appraisal Guide. Norbert J. Nelson. (West Lafayette, IN, Purdue University), Rev. 1976.

   In the first part this guide secures general information about the site, e.g., status, size, cost, sketch. A second part evaluates three site features: acceptability, accessibility, and suitability. A third section evaluates site development features: building placement, grounds beautification, site surfaces, service areas, and site layout. Two scores are obtained, one for features and the other for development.

6. School Building Appraisal Guide. Norbert J. Nelson. (West Lafayette, IN, Purdue University), Rev. 1972.

   This is a three part evaluation instrument. Part I secures general information about the facility. Part II evaluates construction specifications by assessing eight environmental features: spatial, visual, sonic, thermal, equipment, structural, services, hygenic-safety. Part III evaluates performance specifications for individual stations, areas or units relative to adequacy, aesthetics, climate control, layout, suitability, and composite. A scoring procedure is given.

7. Guide for Evaluating School Buildings. R. D. McLeary. (Cambridge, MA, New England School Development Council), April 1952. 52 pp.

   This manual is for use in evaluating and scoring school buildings and sites and directions for scoring are

explained. Point values vary as to features being considered. Separate profile charts are to be developed for sites, service systems, classrooms, special rooms, and composite.

8. Vocational - Technical Facilities for Secondary Schools: A Planning Guide. J. T. Nerden. (Columbus, OH: Council of Educational Facility Planners). 44 pp.

   This planning guide provides a comprehensive approach to planning vocational-technical education facilities. Background to consider in design considerations is presented along with suggested planning procedures. The appendix includes a vocational-technical education survey. Section 7 of the manual discusses characteristics of vocational-technical shops and laboratories.

9. A Guide to Preparing Educational Specifications for Secondary Industrial Arts Facilities. Ralph V. Steeb. (preparer) (Charleston, WV: American Council of Industrial Arts Supervisors), 1974. 34 pp.

   This monograph identifies descriptions and standards which may serve as a basis for facility planning decisions. Goals and objectives of programs are presented along with program and space data. Special features (e.g., climate control, acoustics, aesthetics, and utilities) are presented.

10. "How to Evaulate Quality." N. L. George. School Board Journal. January, 1959, pp. 29-31.

    This article discusses building elements based on type of architecture, height of building, and kind of construction (structure, electrical and heating - ventilation). A check list gives cost range based on variations in building elements.

11. Educational Facilities Planning, Remodeling and Management. B. Castaldi. (Boston, MA: Allyn and Bacon), 1977. 502 pp.

    This comprehensive book covers a wide range of elements associated with planning, designing, remodeling, and maintaining educational facilities. Tables are included with suggested standards for facilities, e.g., Table 13.1 - Specialized Spaces. Details on the various environments of facilities, such as thermal or visual, are presented along with formulas to use in determining such things as space or remodeling needs.

12. Complete Guide for Planning New Schools. N. L. Englehardt. (West Nyack, NY: Parker Publishing Company), 1970. 296 pp.

The book provides to facility planners information about planning problems and submits realistic solutions for them. Information is presented about buildings and sites in general. Size standards are suggested and layouts of facilities are shown. Details on certain areas such as business education and industrial arts are covered.

13. Facility Options. C. W. Brubaker. (Columbus, OH: Council of Educational Facility Planners, Int'l.). 19 pp.

This is one monograph in a series on the topic of Spaces for Career Education, developed as part of the Michigan Career Education Facilities Project. The issue of whether to build new facilities or use existing facilities is discussed. Trends are given and options are presented.

14. Council of Educational Facility Planners (publications as listed below). Columbus, OH: Council of Educational Planners.

a) Guide for Planning Educational Facilities.
b) Vocational Technical Facilities for Secondary Schools
c) Planning for Change
d) Construction Options
e) Vocational Facilities Digest Services

The various guides and books listed above are general in nature. The information contained within them is addressed primarily to administrators, educators, and school board members. The Guide for Planning Educational Facilities mainly deals with general spacing considerations, scheduling, contracting, etc. The four other publications address the specific areas in a general, overall way. Very little technical, usable data, which could be utilized per se in an evaluative instrument, is found in any of these publications. In summary, the above publications synthesize the current thinking of experts in school house planning on a level understandable to a lay person or nonconstruction professional. All of the above publications are good general reading.

15. Appraisal Guide for School Facilities. Harold L. Hawkins. (Midland, MI: Pendell Publishing Company), 1973. 96 pp.

This publication provides a framework from which administrators and nonconstruction professionals can evaluate educational buildings. It was not comprehensive or technical in nature. The author does address various technical areas such as site, building environment, space utilization, structural - mechanical, etc., on a very nontechnical basis. The author does provide field tested guides, formats, and forms. However, many of the areas evaluated are approached on a totally subjective basis. The format and forms which the author provides for summary are excellent. The forms which the author suggests using are unduly lengthy for the type of evaluation information collected. In summary, the book was considered excellent as a starting point in the development of a comprehensive evaluative instrument.

16. MEEB: Model for the Evaluation of Educational Buildings. Carrol W. McGuffey. (Chicago, IL: Department of Facilities Planning, Chicago Board of Education), 1974. 92 pp.

Like the Hawkins book, McGuffey's book attempts to approach school building evaluation on a multidimensional basis. As such, his evaluation instrument contains considerable subjective measures. The overall data collecting forms are considered too lengthy for efficient field observation. Both the quantitative and qualitative subsystems tend to be highly subjective. Like the Hawkins book, this one does provide an excellent starting point.

17. A Manual for Evaluating School Facilities. G. W. Reida. (Topeka, KS: State Department of Public Instruction), 1972.

This guide addresses each of the major categories in evaluating a structure, i.e., heating, ventilating, fire protection, building structure, site, etc. However, the guide is designed and addresses itself for the nonprofessional, i.e., lay school board, citizens committee, administrators, etc. As such, the reviewer did not feel that the guide was technical enough for the type of evaluative task at hand. Furthermore, the guide did not draw together each of the various components into an overall format for management decision. The guide does provide a beginning point of reference and a general overall picture of the problems in evaluating educational structures.

The following list of publications written generally for the nonprofessional and dealing with specific topics was reviewed. They were considered to be good general reading material.

18. Quality Profiles - A Report by the Caudill Rowlett Scott Team. Charles Lawrence, Frank Lawyer, and William Caudill. (Houston, TX: Caudill, Rowlett and Scott, Architects), 1964.

19. "Human Requirements for Buildings." Robert F. Legget. Build International, 5, 4 (July-August 1972), pp. 234-238. EJ 065 721.

20. School Facilities Obsolescence Survey. Donald Leu, Floyd Parker, and Kenneth Glass. (East Lansing, MI: Michigan State University), 1969.

21. Guide for Evaluating School Buildings. Ralph D. McLeary. (Cambridge, MA: New England School Development Council), 1952.

22. "New Evaluative Criteria Geared to Detailed Ratings." Nation's Schools, 84, 2 (August 1969), pp. 56, 58. EJ 007 066.

23. "Revitalization of Existing Educational Facilities: An Overview." Henry J. Rissetto. IAR Research Bulletin, 15, 2 (January 1975), pp. 1-2, 6-7.

24. Rehabilitation of Existing School Buildings or Construction of New Buildings? E. B. Sessions. Criteria for Board of Education, Administrators and School Business Officials. Chicago: Research Corporation, Association of School Business Officials, 1964.

25. School Building Evaluator - Profiles. The Ohio State University. (Columbus, OH: Bureau of Educational Research and Service, 1960. Mimeographed.

Cost Estimation Procedures for Remodeling, Renovation, and New Construction

The purpose of this section of the literature review was to determine the feasibility of transferring the data collected on the Site and Facility Inventory Evaluation Form

provided in the assessment packet into renovation cost information. Educational literature contained limited useful information. Castaldi's book does present a cost formula for determining the feasibility of modernizing an old school facility vs. building a new structure. The information that is presented, however, does not indicate how to determine costs without the aid of an architect, engineer, or special cost estimator.

Information for use in determining the costs of improving the vocational facilities to meet adequate standards was available in the construction cost manuals or the industrial appraising-evaluation services. These manuals are the tools that the architects, construction cost estimators, and industrial real estate appraisers use to construct cost build-ups for a new or remodeled facility.

Selected Annotated Bibliography

1. Educational Facilities. Basil Castaldi. (Boston, MA: Allyn and Bacon, Inc.), 1977.

This publication is a reference that offers the reader step-by-step guidelines to follow during every phase of planning, building, and renewing educational facilities. Chapters 15 and 16 are useful for determining whether or not a facility can be modernized. The author offers a list of items to consider as well as a cost formula for comparing modernization vs. new construction. Items to consider in modernization are the adequacy of the site, the building's suitability for inclusion in the district's long-range plans, the reasonableness of modernization in terms of cost, the feasibility of modernization in terms of the proposed educational program, and the acceptability of the proposed modernization as an acceptable potential solution.

2. 1977 Dodge Manual for Building Construction Pricing and Scheduling. John H. Farley, ed. (New York, NY: Dodge Building Cost Services; McGraw-Hill Information System Company), 1976.

   This manual provides up-to-date unit costs which consist of labor and materials per unit. Units are generally given in square feet, linear feet, etc. These costs are average for the United States and can be adjusted to the 104 various communities listed. Costs per unit are given for sitework, concrete masonry, wood and plastics, metals, thermal and moisture protection, doors and windows, finishes, equipment, conveying systems, mechanical-plumbing, mechanical-HVAC and electrical.

   A computer estimating service is described with all necessary form and example for determining the cost of a building project for either new or remodeled construction. Also, a monthly update publication on unit costs is available.

3. Building Construction Cost Data - 1977. Robert Sturgis Godfrey. (Duxbury, MA: Robert Snow Means Company, Inc.), 1977.

   This publication provides over 10,000 average unit costs for a wide variety of building construction items for use in making engineering estimates. Approximately 500 companies across the United States provided the data necessary to compile this document. Data for making adjustments for local or regional costs are provided.

   A section is included that provides the square foot and cubic foot costs of different types of school construction. The actual cost of any project is determined by the quality of materials or design, overtime required, size of job, location, and other factors such as unions, weather, and site.

4. Marshall Valuation Service. (Los Angeles, CA: Marshall and Swift Publishing Company), 1975.

   The Marshall Valuation Service is designed as a guide to the determination of replacement of reproduction cost. This service provides the actual end costs of a structure to user. They reflect labor efficiency, cost of money, fees, and many other items which may be committed from a build-up cost of sticks, stones, and sweat.

By determining the dimensions of a structure and by comparing it with the pictures presented in the manual, a person is able to determine a cubic foot or a square foot cost from which a total cost is calculated. This manual has a special section on schools. If necessary, the build-up costs can be determined from other tables in the manual.

Marshall Valuation Service provides for a computerized cost determination for any facility under construction.

5. Facilities and Utilization Study 1975. North Carolina State Commission on Higher Education Facilities. (Raleigh, NC: The University of North Carolina. North Carolina State Commission on Higher Education Facilities), August, 1969. 169 pp.

   This facilities study reflects the status of space in North Carolina institutions of higher education. Facility terms are defined. Table data on space utilization, interior space characteristics, and building characteristics are presented. Estimated costs to renovate and replace are shown.

6. Building Cost File - 1976 - Central Edition. (New York, NY: Construction Publishing Company, Inc.), 1976.

   This publication lists the unit costs of over 50 trade groups based upon average prices in the United States. It also provides regional and local cost differentials, as well as a section on the cost of demolition for remodeling projects.

   Unit costs are a composite of labor, material, and equipment. The costs do not include markup, overhead, or management costs of the general contractor. These unit costs are used for the following purposes:
   1. To establish project feasibility and initial project budgets
   2. To provide design guidance in developing a project within a fixed budget
   3. To permit evaluation of alternative design schemes or material selections
   4. To anticipate contractor bids
   5. To determine the value of contract modification.

   These values are used for school construction and remodeling.

7. 1978 Dodge Construction Systems Costs. (New York, NY: (McGraw-Hill Information Systems Company), 1977.

This publication lists the unit costs per square foot and the percentage of total cost for the major construction components. It gives cost breakdowns for most major types of building construction, including a section on vocational school construction. Also listed are cost breakdowns for low average, average, and high average for the various types of buildings.

This publication is published annually.

Directories of Resource Persons in Indiana

To facilitate information gathering and to develop panel member lists for the Modified Delphi process, it was necessary to locate information on resource persons in the following categories:

1. State Advisory Council for Vocational Education
2. State Board of Vocational/Technical Education
3. Department of Public Instruction
4. Area vocational education directors
5. Comprehensive high school vocational directors
6. University facility specialists
7. Vocational teachers

Table II-1 was created to show the resource manual for locating persons from the above list. This table shows the resource person category, the proper reference manual, and the page numbers for location of the necessary information.

No lists of these resource persons were compiled, but as additional resource persons were needed for the project, these sources were reviewed.

Table II-1. Directories for Location of Resource Persons in Indiana.

Classifications	References/Page Numbers
State Advisory Council	7:i-ii
State Board Vocational/Technical Education	1:8-9; 5:11
Department of Public Instruction (DVE)	3:6
Area Vocational Education Director	1:10-14; 2:1-11
Comprehensive High School Vocational Education Directors	1:10-14
University Facilities Specialist	2:12-26; 4:1-11
Classroom Teachers	6:1-39

1. Indiana School Directory, 76-77, Indiana Department of Public Instruction.
2. Directory of Secondary, Post Secondary, and Adult Vocational Administrators, 1976-1977, State Board, Vocational/Technical Ecucation.
3. Spirit of Solidarity, Division of Vocational Education, Indiana Department of Public Instruction.
4. Directory of Indiana Vocational Teacher Educators, 1976-1977, State Board, Vocational/Technical Education.
5. Administration and Coordination Plan for Vocational Education in Indiana, State Board, Vocational/Technical Education.
6. EIR38, 1976-1977 Director of Public School Certified Employees, Vocational Teachers of Indiana Public Schools, Indiana Department of Instruction.
7. Vocational Education, 1975-1976, Advisory Council for Vocational Education.

CHAPTER III

MODIFIED DELPHI STUDY

In school facility planning, a general rule of thumb is to address the problem of what kinds of buildings and sites likely will be needed to accommodate adequately programs in the years ahead. After searching the literature and reviewing State of Indiana guidelines and standards for school facilities, a modified Delphi study was undertaken. Such a study would provide a data base for estimating selected aspects of future facility needs. In this case the process was restricted to facilities to accommodate secondary school programs of vocational education in Indiana.

A Modified Delphi Technique

Effective planning for the future is greatly aided where knowledgeable persons describe and assign value to specific events and/or ideas. The Delphi technique is one of the approaches used for forecasting and describing events and ideas. Since its inception in the late fifties, the technique has been tested and found to be reliable by business, government, and military organizations.

Because of the nature of certain activities, absolute answers derived from exact scientific study are not possible. Many decisions hence must be based on other than vigorous

scientific evidence. The considered beliefs of experts, specialists, and informed persons tend to be the next most reliable course for answers. Since a single person might err, reliability is increased as more experts, specialists, and informed persons are consulted. The committee approach, with face-to-face contacts, has certain drawbacks which make it difficult to secure objective judgments and evaluations. A committee decision is often a compromise rather than a consensus. In the Delphi these drawbacks are minimized by using unidentified panelists to respond to instruments.

Panelists are requested to respond to statements and submit additional ones that are deemed important and have not been included. Panelists also may change the original statements and indicate why. Special insights perhaps not shared by other panelists may be reasons for suggesting modifications, changes, or eliminations of statements. The modified instrument is returned to the panelists seeking responses. If after the second return concensus has not been reached, the instrument is again modified and resubmitted to the panelists. Consensus in a Delphi means a collective viewpoint indicating general agreement and accord.

In this research, instruments were developed for use in assessing vocational-educational facilities in Indiana. One of the inputs to be used in instrument development was data secured from a modified Delphi study.

Modified Delphi Procedures

A first step in undertaking a modified Delphi study was to design a Delphi survey instrument (see example in Appendix III-2) for each of six program areas in secondary school vocational education. The six program areas (clusters) were Agribusiness Education, Business Education, Distributive Education, Health Occupations Education, Home Economic Education, and Industrial Education.

While developing the survey instrument for the study, the Delphi panelists were selected for each of the six program areas. Reputational techniques were used to solicit names of potential panelists. Knowledgeable persons were requested to give the name or names of persons with know-how about facilities in selected vocational programs. The panels were composed of university professors, Division of Vocational Education personnel (DPI), members of the State Board of Vocational and Technical Education, architects, teachers, vocational school directors, and directors of facilities planning. The intent was to generate a panel of about ten persons for each program area. Potential panelists were contacted by letter with accompanying information (see Appendix III-2). The panels for each program area were comprised of the following numbers:

Program Area	Number
Agribusiness Education	9
Business Education	9
Distributive Education	12
Health Occupations Education	10
Home Economics Education	10
Industrial Education	11
Total	61

Data on the first round of the Delphi Survey responses are reported in Table III-1.

Table III-1. Delphi Survey Round 1.

Vocational Program Area	Number of Questionnaires Sent	Number of Questionnaires Returned	Percent Returned
Agribusiness Education	9	7	78%
Business Education	9	8	89%
Distributive Education	12	10	83%
Health Occupations Education	10	7	70%
Home Economics Education	10	8	80%
Industrial Education	11	6	55%
Totals/Averages	61	46	75%

The average return rate for all programs was 75 percent, ranging from a high return (89%) for Business Education panelists to a low return (55%) for Industrial

Education panelists. In that a procedure for the careful selection of panelists was followed, it was concluded that the number of returns was adequate in all instances.

The Delphi survey instrument was changed to fit first round suggestions and sent out again (see example in Appendix III-3). The purpose of the second round Delphi was to obtain consensus through revision on the statements from Round 1 that had not received consensus and to establish consensus on a series of new statements formulated for each program area. The new statements were a result of suggestions and comments received from respondents on the Round 1 Delphi.

Reaching Consensus

Where there was consensus among panelists concerning selected features of vocational facilities, the feature was deemed a pertinent one to consider in planning facilities to accommodate vocational programs in the years ahead. Consensus is defined as at least 75 percent agreement among the panelists for each of the vocational program areas.

Table III-2 summarizes the status of consensus for items included in the Round 1 survey.

As shown in Table III-2, of the 225 items submitted to the respective panelists in 6 program areas, consensus was needed on 181 features of vocational facilities (80%) on the first Delphi round. This means that for every four out of five items generated from the search of the literature

Table III-2. Round 1 Consensus Summary.

Program Area	Round 1		
	No. Statements Sent	No. Consensus Statements Received	Percent Consensus
Agribusiness Education	35	27	77%
Business Education	24	19	79%
Distributive Education	15	14	93%
Health Occupations Education	20	15	75%
Home Economics Education	45	38	84%
Industrial Education	86	68	79%
Totals/Averages	225	181	80%

on vocational education, there was agreement among panelists about their desirability as features of vocational facilities. The consensus ranged from a high of 95 percent for Distributive Education to a low of 75 percent for Health Occupations.

Table III-3 reports data on the second round of the Delphi. Round 2 included renumbered and reworded statements for which consensus was not rendered on Round 1 and new statements suggested by the Round 1 returns.

On the second round of the Delphi, during which a total of 66 items were broken down by program area and sent to the panelists, consensus was reached on 55 of these items (83%). A 100 percent consensus was reached for the Business

Table III-3. Round 2 Consensus Summary.

Program Area	Round 2		
	No. Statements Sent	No. Consensus Statements Received	Percent Consensus
Agribusiness Education	13	12	92%
Business Education	7	7	100%
Distributive Education	7	5	71%
Health Occupations Education	8	8	100%
Home Economics Education	11	9	82%
Industrial Education	20	14	70%
Totals/Averages	66	55	83%

and Health Occupation areas, ranging to a low of 70 percent consensus for Industrial Education.

Table III-4 presents a consensus summary of the two Delphi rounds. Column 1 gives the original number of statements per program area with the number of statements of consensus received shown in Column 2. Column 3 gives the number of revised statements and Column 5 gives the number of new statements included in the second round.

As noted in Column 9, consensus was rendered on 96 percent of the statements submitted. The range was between 90 percent in Distributive Education and 100 percent in Business Education and Health Occupations Education. It was concluded that reasonable consensus was attained in all six program areas.

Table III-4. Consensus Summary of Statements for Rounds 1 and 2 of Delphi.

Vocational Program Cluster	Column 1 Round 1 Statements Sent	2 Consensus Statements Round 1 Received	3 Revised Round 2 Statements Sent	4 Consensus Revised Round 2 Received	5 New Statements Sent	6 Consensus Received	7 Total No. of Statements Cols. 2+3+5	8 Total No. Consensus Statements Cols. 2+4+6	9 Percent of Consensus Col.8/ Col.7
Agribusiness Education	35	27	8	8	5	4	40	39	98%
Business Education	24	19	5	5	2	2	26	26	100%
Distributive Education	15	14	1	0	6	5	21	10	90%
Health Occupation Education	20	15	5	5	3	3	23	23	100%
Home Economics Education	45	38	7	5	4	4	49	47	95%
Industrial Education	86	68	18	14	2	0	88	82	93%
Totals/Averages	225	181	44	37	22	18	247	236	96%

Modified Delphi Results

For the six program areas (Agribusiness, Business, Distributive, Health Occupations, Home Economics, and Industrial Education), consensus was reached on features believed pertinent if facilities are to be adequate to accommodate vocational programs. It is important to note that the reaching of consensus on selected features of vocational education facilities does not mean that all features were considered. But adequate facilities should consider the features that were identified as relevant to adequate accommodation of programs based on viewpoints of the panelists.

Agribusiness Education

Tables III-5 and III-6 report features on which consensus was reached and identified by level of importance as either being essential or desirable.

Business Education

Tables III-7 and III-8 identify features on which consensus was reached and identified by level of importance for vocational programs in Business Education.

Distributive Education

Tables III-9 and III-10 show consensus items and their level of importance for facilities to accommodate vocational programs in Distributive Education.

Table III-5. Agribusiness Education: Round 1 of Delphi Showing Consensus and Importance of Item.

Consensus with importance level of item determined to be essential
1. The Agribusiness Education area for classes of approximately 20 students should contain the following: a) Classroom of 750 square feet b) Office-conference room of 100 square feet c) Laboratory of 150 square feet d) Ag shop
2. An adequate shop should have a ceiling height of at least 12 feet
3. The greenhouse must be equipped with adequate heating and ventilation systems
4. Exhaust systems should be provided for the welding areas and paint areas
5. Compressed air service should be provided in the shop area
6. Single phase and triple phase power should be provided in the shop area
7. A master control switch should be provided for regulation of all power in the shop
8. Water supply should be provided to all areas, including outside hose bibb
9. The shop should have floor drains connected to a tradewaste disposal system
10. Heating in the shop area should be regulated by a separate thermostat
11. Counter space with an acid resistant sink and plumbing should be provided in the laboratory area
12. There should be a nonslip surface on the floor around all power machines
13. Glass partitions, 42 inches above the floor, should be installed to allow vision of all areas from both the office and the teaching station in the classroom
14. A lighted display window should be provided for the Agribusiness Department and located in a high traffic area

Table III-5. Continued

Consensus with importance level of item determined to be desirable but not essential
1. An outside, paved, lighted, fenced shop area of 2,400 square feet should be adjacent to the shop
2. A ceiling height of nine feet is adequate for all areas other than shops
3. The paint booth should have an outside make-up air heater
4. Light intensity at desk level in the classroom, office-conference room, and laboratory areas should be about 50 foot candles
5. Light intensity at desk level in all other areas should be about 40 foot candles
6. Electrical outlets (20 amp., 120 volt) should be located every eight feet on walls in all areas
7. The greenhouse should be equipped with a misting system
8. The greenhouse should be covered with glass or fiberglass rather than polyethylene or vinyl
9. The greenhouse should have concrete or masonry walkways

Table III-6. Agribusiness Education: Round 2 of Delphi Showing Consensus of Item.

Consensus on revised items with importance level of essentials from the Delphi Round 1 Instrument

1. An adequate Agribusiness Education suite does not necessarily need to contain a greenhouse
   a) The greenhouse, if provided, should contain 1,200 square feet
2. An Agribusiness Education area for 20 students should contain a total of 4,300 square feet distributed as follows:
   a) Shop area of 3,000 square feet
   b) Storage area of 300 square feet
   c) Remainder of area in classroom, laboratory, and office
3. An adequate shop should have a ceiling height of 18 feet or more
4. All ceilings except for shop areas should be treated with sound absorbing material
5. The shop should have an overhead door 14 feet by 16 feet or larger
6. One tradewaste drain should be of the trench type design and should be located by the overhead door

Consensus with importance level of each item determined to be desirable but not essential

1. An Agribusiness Education area should contain a reference library of 200 square feet
2. An Agribusiness Education shop area should contain a one ton traveling overhead loft
3. An Agribusiness Education shop should contain a tool storage crib of 300 square feet
4. An Agribusiness Education shop should have provisions for overhead electrical water and air drop hose

Table III-7. Business Education: Round 1 of Delphi Showing Consensus and Importance of Item.

Consensus with importance level of each item determined to be essential

1. Adequate space provisions for a Business Education suite are as follows:
   a) Classroom (30 students) of 750 square feet
   b) Teacher's office of 150 square feet
   c) Laboratory for Typing I (35 students) of 1,200 square feet
   d) Laboratory for Typing II, Shorthand I and II (30 students) of 1,200 square feet
   3) Laboratory for Office Machines/Office Practice (20 students) of 1,200 square feet

2. The Business Education rooms should be arranged in a suite with the stenography room adjoining the typing room and the bookkeeping room adjoining the business machines room

3. Duplex electrical outlets (120 volt) should be placed flush with the floor and should be provided for every student station in all laboratories where machines are used

4. A business machines laboratory should be equipped with a sink with hot and cold water

5. The Business Education Department should have a lighted display window facing a high traffic area

Consensus with importance level of each item determined to be desirable but not essential

1. Adequate space in a Business Education suite for a laboratory for record keeping, bookkeeping, and business math (30 students) would be 1,200 square feet

2. A 220 volt single phase electrical service should be provided to Business Education laboratories

3. A master electrical switch should be available to control all electrical outlets in each room containing a large number of office machines

4. Business machines laboratories should be provided with temperature and humidity control systems

5. Business Education rooms should be carpeted for noise control

6. Ceilings of all Business Education areas should be acoustically treated

Table III-7. Continued

7. A ceiling height of nine feet is adquate for all Business Education areas
8. Noise transfer between units should be controlled through the use of sound-deadening materials on walls

Table III-8. Round 2 of Delphi Showing Consensus of Item and Importance Level.

Consensus on revised items from the Delphi Round 1 Instrument determined to be essential
1. A minimum Business Education suite should contain a classroom, a teacher's office and at least one multipurpose laboratory which will serve every subject offered
2. Laboratory for keypunch and data processing should be 1,200 square feet
3. Light intensity at desk level should be about 70 foot candles
4. Convenience electrical outlets (120 volt) should be located at six foot intervals on the walls of each Business Education room
5. All Business Education rooms should share a common hallway for movement throughout the suite
Consensus with importance level of each item determined to be desirable but not essential
1. The keypunch and data processing area should have telephone jacks for computer terminals
2. The Business Education areas should have television jacks to a central system or antenna

Table III-9. Distributive Education: Round 1 Delphi Showing Consensus and Importance of Item

Consensus with importance level for each item determined to be essential

1. An adequate Distributive Education suite should contain a classroom-laboratory, a teacher/coordinator's office, and a storage-work room
2. The Distributive Education area should contain the following:
   a) A classroom of about 1,050 square feet
   b) Storage-work room of about 300 square feet
3. The Distributive Education areas should be heated, cooled, and humidity controlled
4. Light intensity at desk level should be 50 foot candles
5. Electrical outlets (20 amp., 120 volt) should be located every eight feet along the walls of all Distributive Education areas
6. Telephone service should be provided in the teacher/coordinator's office
7. Glass partitions should be installed between the classroom-laboratory and teacher/coordinator's office in order to allow an unobstructed view of the laboratory from the office

Consensus with importance level for each item determined to be desirable but not essential

1. The Distributive Education area should contain a teacher/coordinator's office of 100 square feet
2. A ceiling height of nine feet is adequate in all Distributive Education areas
3. The walls and ceilings of all Distributive Education areas should be acoustically treated
4. The Distributive Education suite should be equipped with a master control switch for regulation of all power
5. The storage-work area should contain a double sink and counter
6. A lighted display window should be six feet in depth, seven feet in height and eight feet in width, with ceiling and floor lights, facilities for flood lights, and entrance from the storage-work room

Table III-10. Distributive Education: Round 2 of Delphi Showing Consensus of Item and Importance Level.*

Consensus with importance level of each item determined to be essential

1. The print machine and sign making area should contain a sink with counter space

Consensus with importance level of each item determined to be desirable but not essential

1. All Distributive Education areas should be carpeted
2. A Distributive Education suite should contain space for print machines and sign making
3. The Distributive Education laboratory should have electrical outlets for overhead spot lights
4. All Distributive Education areas should have television jacks to a central system or antenna

*Reasons for No consensus to the New statements without consensus

1. The Distributive Education area should be near the other Business Education areas (new statement)
   - 1.1 Distributive Education area should be near the other Business Education areas on a well-traveled hall
   - 1.2 In new construction, yes, however, the traffic flow pattern is more important than location for Distributive Education. It should be in the vocational area, if Business area is there, fine
2. The Distributive Education laboratory should have a 220 volt power outlet
   - 2.1 Not aware of any appliances or display equipment requiring 220 volt

Health Occupations Education

Tables III-11 and III-12 report results of Rounds 1 and 2 of the modified Delphi study for vocational programs in Health Occupations.

Home Economics Education

The results of the modified Delphi for Home Economics Education are reported in Tables III-13 and III-14. The tables for the two rounds give consensus items and level of perceived importance of the features on which consensus was reached.

Industrial Education

Delphi information for features of facilities for Industrial Education is reported in Tables III-15 and III-16. Reported in the tables are consensus items and their level of importance generally and for specific fields within the area of Industrial Education.

Summary

The modified Delphi was undertaken to determine features of facilities for vocational education programs where a panel of specialists reached consensus as to the nature of features that are needed and their importance to a program. These are not standards but rather guides to use in assessing the status of the adequacy of a facility to accommodate a particular vocational program. In this study, ideas from the Delphi were used in the development of the School Building/Site

Table III-11. Health Occupations: Round 1 Delphi Showing Consensus and Importance of Each Item.

Consensus with importance level of item determined to be essential
1. A Health Occupations Education area for 20 students should contain the following: a) Classroom of 750 square feet b) Storage areas of 200 square feet c) Teacher's office of 100 square feet
2. Separate entrances and exits should be provided for the classroom, each section of the medical laboratories, and the nursing area
3. The walls and ceilings of all Health Occupations Education areas should be acoustically treated
4. The Health Occupations Education area should be heated, cooled, and humidity controlled
5. The light intensity at desk level should be at least 50 foot candles
6. Electrical outlets (20 amps, 120 volts) should be located every eight feet along the walls of all Health Occupations Education areas
7. The Health Occupations Education suite should be equipped with a master control switch for regulations of all power
8. Hot and cold water should be provided in all areas
Consensus with importance level of each item described to be desirable but not essential
1. The teacher's office should be in the center of the suite
2. The major sections of the Health Occupations Education area should be approximately a width to length ratio of 1 to 1.5
3. A hospital type patient care bathroom should be adjacent to the nursing area
4. Glass partitions, 42 inches above the floor, should be installed to allow vision of the area around the office
5. A lighted display window should be provided for Health Occupations Education Department and located in a high traffic area

Table III-12. Health Occupations: Round 2 of Delphi Showing Consensus and Importance of Items

Consensus on revised items from the Delphi Round 1 Instrument

1. An adequate Health Occupations Education suite should contain a classroom, medical laboratories, nursing area, storage areas, and a teacher's office, but does not need a utility room for laundry

2. A Health Occupations Education area for 20 students should contain the following:
   a) Nursing area of 750 square feet
   b) Medical laboratories of 1,500 square feet

3. All doorways of medical laboratories and nursing areas should be four feet wide to accommodate a hospital bed

4. A ceiling light of eight feet is adequate for all Health Occupations Education areas

Consensus with importance level of each item determined to be desirable but not essential

1. A Health Occupations Education area should contain space and built-in shelves for a technical library

2. A Health Occupations Education area should contain a dressing room of 100 square feet

Table III-13. Home Economics Education: Round 1 of Delphi Showing Consensus and Importance of Item.

Consensus with importance level of each item determined to be essential
1. An adequate Homemaking Education suite should contain a foods labortory, a clothing laboratory, a living-dining area, a storage area, a fitting room, and a teacher's office
2. The all-purpose Homemaking Education area for 20 students should contain the following: a) Food laboratory of 1,000 square feet b) Clothing laboratory of 900 square feet c) Storage of 500 square feet
3. An Occupational Food Service area for 20 students should contain the following: a) Laboratory of 900 square feet b) Storage of 50 square feet
4. A child care services area for 20 students should include a classroom, a laboratory, a storage area, a compact kitchen, a children's toilet, a teacher's office, and an outside play area
5. A child care services suite for 20 students should include the following: a) Classroom of 700 square feet b) Laboratory of 1,300 square feet c) Storage of 150 square feet d) Children's toilet of 120 square feet
7. An institutional and home management services suite for 20 students should contain the following: a) Bedroom of 120 square feet b) Bathroom of 40 square feet
8. A clothing management, production, and services suite should include a clothing laboratory, a walk-in storage area, a fitting room, and a teacher's office
9. A clothing management, production, and services suite should contain a teacher's office of 100 square feet
10. All Home Economics laboratories should be equipped with master control switches for the regulation of power to laboratory machines
11. A lighted display window should be provided for the Home Economics Department and located in a high traffic area

Table III-14. Home Economics: Round 2 of Delphi Showing Consensus and Importance of Item.

Consensus on revised items from the Delphi Round 1 Instrument

1. A Homemaking Education teacher's office should contain 100 square feet

2. A Homemaking Education area fitting room should contain 100 square feet

3. An occupational food service teacher's office should contain 100 square feet

4. A clothing management, production, and services suite for 20 students should contain the following:
   a) Walk-in storage area of 200 square feet
   b) Fitting room of 100 square feet

Consensus with importance level of each item deteremined to be desirable but not essential

1. The Vocational Home Economics suite should be located on the ground floor with an outside entrance for delivery of supplies

2. All laboratories should have a six foot by eight foot entry/exit access for easy installation and removal of large equipment

3. All floors in food service and laundering areas should be grease proof and stain resistant

4. All Vocational Home Economics areas should have television jacks to a central system or antenna

6. An institutional and home management services suite for 20 students should contain a storage area of 140 square feet

7. A clothing management, production, and services suite for 20 students should contain a clothing laboratory of 750 square feet

8. Home Economics laboratories should be located on the first floor and near an outside entrance

9. A ducted type hood is needed over every range or surface area in the Home Economics laboratories

10. Single phase, 240 volt electrical service should be provided to all laboratories in the Home Economics area

Table III-14. Continued

11. Electrical outlets (20 amp., 120 voltes) should be located at intervals of eight feet along the walls of all Home Economics laboratories

12. Provisions should be made for properly venting the clothes dryer

13. Sinks should be equipped with garbage disposal units

14. A floor drain should be provided in the laundry area

15. A ceiling height of nine feet in the clear is adequate for all Home Economics areas

16. The walls and ceilings of all Home Economics areas should be acoustically treated

17. Light intensity at desk level should be about 50 foot candles

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Consensus with importance level of each item determined to be desirable but not essential

1. A Vocational Home Economics facility should include separate areas for Homemaking Education and for each Occupational Home Economics subject offered

2. An all-purpose Homemaking Education area for 20 students should contain a living-dining area of 320 square feet

3. An occupational food services suite should include a laboratory, a dining area, a classroom, a dressing area, a storage area, and a teacher's office

4. An occupational food service area for 20 students should contain a dressing room of 120 square feet

5. A child care service suite for 20 students should contain the following:
   a) Compact kitchen of 150 square feet
   b) Office of 80 square feet

6. An institutional and home management service suite should include a classroom, a bedroom, a bathroom and a storage area

Table III-14. Continued

*Reasons for No responses to the New statements without consensus.

4. An institutional and home management services suite for 20 students should contain a classroom of 800 square feet

   4.1 The home management services suite should contain a classroom of between 800 and 1,200 square feet

6. Gas service should be provided to the foods area only (new statement)

   6.1 Gas dryers are provided free by the gas utility in our extremely tight budget, providing electric dryers for our 17 schools would be a sizable item; gas dryers are also cheaper to operate; students should also be aware of both types of fuel

Table III-15. Industrial Education: Round 1 of Delphi Showing Consensus and Importance of Item.

Consensus with importance level of each item determined to be essential

1. An adequate Industrial Education facility for a program area should provide the following:
   a) A laboratory or shop
   b) An office
   c) An equipment room
   d) A storage room
   e) Classroom access
2. Each office should contain 100 square feet
3. The classroom should contain a minimum of 500 square feet for a class of 20 students
4. Temperature controls should be separate for laboratories and/or shops and other areas
5. Water supply should be provided to all laboratories and shops
6. Each laboratory and shop area should have a master control switch for regulation of all electrical power
7. Electrical outlets (20 amps., 120 volts) should be located at every eight feet of walls in all areas
8. Each laboratory or shop should have appropriate provisions for the safe storage of flammable materials
9. Each laboratory or shop should have a student wash area
10. The auto body and fender area should have the following:
    a) Ceiling height of 12 feet
    b) Paint booth exhaust system
    c) Outside make-up air heater
    d) Compressed air available
    e) Single phase, 240 volt electricity available
    f) Concrete floor
    g) Overhead door 12 feet by 12 feet
    h) Convenience door three feet by seven feet beside overhead door
    i) Floor drains
    j) Spray paint booth

Table III-15. Continued

11. The auto mechanics area should have the following:
    a) Special exhaust system for carbon monoxide disposal
    b) Compressed air available
    c) Single phase, 240 volt electricity available
    d) Concrete floor
    e) Overhead door 12 feet by 12 feet
    f) Convenience door three feet by seven feet beside the overhead door
    g) Floor drains
    h) Hydraulic automobile lift

12. The electricity shop area should have the following:
    a) Both single phase and triple phase electricity available
    b) Overhead busway or busduct

13. The television and radio repair shop area should have the following:
    a) Compressed air available
    b) Single phase, 240 volt electricity available

14. The graphic arts area should have the following:
    a) Compressed air available
    b) Both single phase and triple phase electricity available
    c) Provisions for a dark room

15. The machine shop area should have the following:
    a) Concrete floor
    b) Natural gas supply
    c) Compressed air available
    d) Overhead door 12 feet by 12 feet
    e) Convenience door three feet by seven feet beside overhead door
    f) Overhead busway or busduct
    g) Both single phase and triple phase electricity available

16. The welding and cutting shop area should have the following:
    a) Concrete floor
    b) Natural gas supply available
    c) Compressed air available
    d) Both single phase and triple phase electricity available
    e) Overhead door 12 feet by 12 feet
    f) Convenience door three feet by seven feet beside the overhead door

Table III-15. Continued

Consensus with importance level of each item determined to be desirable but not essential

1. The length to width ratio of an adequate laboratory or shop should approximate 1.5 to 1.0
2. The ceiling height of nine feet is adequate for all areas other than laboratories and shops
3. A laboratory or shop should have a minimum width of 30 feet
4. Industrial Education facilities should be located in a separate wing from the main school plant
5. Glass partitions, 42 inches above the floor, should be installed to allow vision of the laboratory or shop area from both the office and the classroom
6. The auto body and fender area should have a natural gas supply available
7. The auto mechanics shop area should have a monorail with chain hoist
8. The drafting area should have a ceiling height of nine feet
9. The electricity shop area should have the following:
   a) Natural gas supply available
   b) Compressed air available
   c) Convenience door three feet by seven feet beside the overhead door
10. The television and radio repair area should have a ceiling height of nine feet
11. The graphic arts area should have a ceiling height of nine feet
12. The machine shop area should have the following:
   a) A ceiling height of 12 feet
   b) A monorail with chain hoist

Table III-16. Industrial Education: Round 2 of Delphi Showing Consensus and Importance of Item.

Consensus on revised items from the Delphi Round 1 Instrument

1. Ceilings should be treated with sound absorbing materials in those areas where noise levels require it

2. Light intensity in all areas except for drafting should be 50 foot candles; drafting should have a minimum of 75 foot candles

3. An overhead exhaust system should serve each laboratory or shop as conditions require

4. Each laboratory or shop area should have one door for equipment access of at least sixty inches in width

5. An electricity laboratory should have a ceiling height of nine feet

6. A graphic arts area should have an outside double door opening eight feet by eight feet

7. A welding and cutting shop should have a ceiling height of at least 14 feet

8. Adequate square footage standards for industrial shops are as follows:
   a) Auto body and fender: 240 square feet per student
   b) Auto mechanics: 240 square feet per student
   c) Drafting: 120 square feet per student
   d) Electricity: 120 square feet per student
   e) Television and radio repair: 120 square feet per student
   f) Graphic arts: 120 square feet per student
   g) Machine shop: 240 square feet per student

*Reasons for the No response to the New statements without consensus

Part I

1. An equipment room should contain a minimum of 200 square feet (new statement)

   1.1 An equipment room should contain a minimum of 300 square feet

   1.2 This general provision should be conditioned by a studied need; it may vary from program to program

Table III-16. Continued

1.3 There is no square foot requirement that will fit all areas; the standard should be set for each area to meet that area's needs

2. A minimum of 100 square feet of storage should be provided for each laboratory or shop (new statement)

2.1 A minimum of 400 square feet of storage should be provided for each laboratory

2.2 This space is not large enough for a laboratory

2.3 A central storage area may be more cost effective in space demand and utilization

2.4 Standards should be set for each area as needed: drafting, 200 square feet; machine trade, 200 square feet; storage, 200 square feet; tool crib; printing, 600 square feet; welding, 200 square feet, etc.

7. An auto mechanics shop should have as a minimum a ceiling height of 12 feet (new statement)

7.1 The ceiling height over the lift areas may need to be 14-16 feet if any trucks are to be serviced

7.2 With a hydraulic hoist more height would be needed

7.3 The ceiling height would need to be 14 feet to clear small vans and trucks when on lift

9. A television and radio repair laboratory should have an outside double door opening eight feet by eight feet (new statement)

9.1 A door opening ten feet by ten feet permits small trucks to be backed in to load and unload

9.2 The general requirement of 60 feet is adequate

9.3 If vehicles are to be serviced in shop, this is needed

9.4 60 inches wide

Table III-16. Continued

Part II

1. A cabinet making shop should contain 240 square feet per student, 4,800 square feet per class of 20 students (new statement)

   1.1 A cabinet making shop should contain 300 square feet per student, 6,000 square feet per class

   1.2 It could be somewhat smaller if activity is not production and storage of produced items

   1.3 It is not needed in Indiana

2. A construction technology shop should contain 100 square feet per student, 2,000 square feet per class of 20 students (new statement)

   2.1 Construction technology is an Industrial Arts area, not vocational. However, if this is in reference to building, trades, then NO central facility is necessary. The requirement for building trades should be a 600 square foot trailer with restroom, tools and equipment, storage and library area. The trailer will be on the lot with the project house

   2.2 Larger areas of at least 200 square feet are needed

   2.3 This requirement is satisfactory if primary laboratory work is in field; if total simulation laboratory is required, this is inadequate

   2.4 The area should contain 300 square feet per student, 6,000 feet per class

Assessment Packet and in the Computer Program as a feature consideration where no definitive standards and guidelines for features were found in data available from official sources (e.g., Department of Public Instruction, State Board of Vocational and Technical Education).

Another use of the Delphi results could be as an information source for use in a facilities planning program. It does give features on which there were consensus and judgments of importance from panelists who were selected as having specializations pertinent to vocational programs and/or facilities.

CHAPTER IV

DEVELOPMENT OF INSTRUMENTS AND PROCEDURES

Instruments for assessment purposes should be applicable and usable in generating data that meet particular needs. Providing a desired level of specificity and an adequate degree of preciseness also are essential considerations in instrument development. Ofttimes attempts are made to make an instrument simple so that it is easy to fill out, only to find out the information collected is too general for intended use. Or attempts may be made to design instruments that can be completed without needing special knowledge and skills. These instruments often give inexact information which will vary from person to person, depending on who gathered the data. Four considerations guided the development of assessment instruments for vocational education:

1. The instruments are to be applicable for assessment of vocational facilities (buildings and sites)
2. The instruments should generate data that are usable for purposes of evaluating facility potential for accommodating vocational programs
3. The instruments ought collect data that are sufficiently specific to be meaningfully interpreted

4. The instruments should generate information that is sufficiently precise both quantitatively and qualitatively to provide definitive properties of facilities.

Refer to the Instruction Manual: School Building/ Site Assessment Packet for Vocational Education Facilities in the Appendices which presents the explanations and instruments developed in the project for assessing facilities.

Tasks Associated with Instrument Development

The project team in making plans for instrument development identified several activities to be pursued. It was decided that a search of the literature should be made to see what was available to use in assessing facilities. Ideas from this search were then used where appropriate in developing instrumentation for this study. A second activity was to order the assessment items into categories that recorded data manageably. This categorization ensured that the computerization was efficient and communication was simplified. Another determination was to ascertain what ought be the degree of detail and specialization required in data collection. Instruments could be too detailed and too complex to have practical use on the one hand and too general and too simple to provide definitive measures on the other hand. It also was decided that certain decisions would require advice and assistance from selected individuals and groups whose

knowledge and expertise would be beneficial to the project team in instrument development and later application. An internal advisory committee was created to assist the project team. In addition, contacts were made with a number of individuals whose special knowledge would be valuable to the team.

Instrument Search

Chapter II, "Guidelines for Facility Planning," discusses the literature search and submits bibliographical materials that were reviewed. Although valuable ideas and information were secured from the literature search, it was found that there were not available suitable instruments that met the four considerations listed at the outset of this chapter. However, ideas on categories for ordering assessment items were suggested, and items for inclusion in instruments were generated from these literature sources.

Building and Site Assessment Categories

Preliminary drafts of building and site assessment instruments were subjected to pilot testing in several schools. Following each application, the instruments were evaluated as to applicability, usability, specificity, and preciseness. Logistical problems also were discussed. The instruments were revised several times before being submitted to the internal advisory committee. Based on the input from the committee, additional revisions were made

until consensus was reached on the final form of the instruments.

The School Building/Site Assessment Packet was divided into four major parts. The first part was for recording identification information and general data. The second part was an inspection form on which to record specific information about a facility. The third part of the packet was the site assessment, which included a recapitulation that summarized the assessment. The fourth part was the building assessment, which also included a building recapitulation summary.

Three categories of information were collected on the cover page of the packet. Identification data and general building and site information were recorded on this page.

The inspection forms included ten categories of data. Identification data that located the particular space was recorded, followed by spatial, construction, electrical, electronic, mechanical, health and safety, and barrier free features. Spaces for recording special equipment and other features also were provided. The inspection forms gave highly specific and/or measured information.

Four categories of site features were included for assessing sites--acceptability, accessibility, suitability, and development. The recapitulation summary gave two general ratings, one for site features and the second for site improvements.

School buildings were assessed on nine categories--spatial, sonic, thermal, visual, hygenic, safety, traffic-flow, equipment and structural components of a building. In the recapitulation summary, general ratings were recorded for the construction and education features of adequacy.

Instrument Detail

After considerable discussion among members of the project team and interaction with members of the interal advisory committee, it was agreed that the instruments used for assessment should be suitable for completion by persons who are generally knowledgeable about vocational programs and school facilities and who have had some special preparation in using the instruments. This became the guide to the detail to be included in the instruments.

The inspection form was designed to provide the quantitative and qualitative detail which would provide specific and precise measures and judgments of facility features. Where such things as type, size, numbers, availability and locations were essential, the inspection form provided this detail. The building and site assessment detail was generated by reacting to several sub-items relating to each of several items for each of the categories. It is believed that such a process improved one's capacity to make valid judgments about building and site components. The building and site recapitulation provided

a basis for generalizing overall ratings derived from recording and coding detailed information.

Internal Advisory Committee

The internal advisory committee was a group formulated to advise the project team and to serve as a referral group for them. The committee was to be generally representative of persons with special knowledge and skills about educational programs, facilities, and planning.

The entire committee met several times during the progress of the study and provided assistance in formulating definitions, clarifying meanings, correcting errors, suggesting formats, and determining potential uses. Individual committee members met with members of the project team on several occasions. These sessions were devoted to item-by-item review of the instruments. Instrument refinement and appropriateness were major contributions that could be credited to the

Applicability Tests and Validity Checks

Two questions confronted the project team. Were the instruments capable of being applied efficiently for assessing vocational facilities? Did the instruments produce desired and sound results? To answer these questions, a series of activities were undertaken. A comparison was made between on-site assessments made by the project team evaluators with assessments of the same facilities made independently by persons officially connected with these

schools. A director of school facility planning provided special training to persons who then assessed facilities. The director evaluated their assessments. Facilities in an out-of-state area community college (vocational) were assessed.

The instruments were applied to two facilities for two programs--one high school and one post-high school--to assess applicability. Several architects conversant with school construction reviewed the Instruction Manual and Instruments. They commented as to the usability for assessment purposes. Appendix IV provides the detail for each of these activities.

In summary, it could be concluded that the instruments can be applied efficiently and generally will yield desirable and sound information.

CHAPTER V

DEVELOPMENT OF COST ESTIMATION MODELS AND COMPUTER PROGRAMS

The Cost Estimation Model and Computer Programs were developed to deal with the following specific objectives of the project:

1. To develop a formula for measuring the estimated unit cost for possible future replacements, modifications, or improvements to meet changing program demands
2. To assess the status of facilities and fixed equipment for vocational education in a sample of Indiana area vocational centers and comprehensive secondary schools
3. To determine the relationship between existing facilities and standards for approved facilities
4. To determine the extent to which existing facilities meet approved guidelines for accommodating physically handicapped students.

Three important considerations that were taken into account in guiding the development of the Model and Computer Programs were:

1. The Cost Estimation Model must be related to the School Building/Site Assessment Pack for Vocational Education Facilities
2. The developed computer programs must be compatible with the State of Indiana's computer system
3. The Cost Estimation Model must be a valid and reliable procedure for cost estimation of renovation projects.

Refer to the Instruction Manual: The School Building Cost Estimation Model and Computer Programs (hereafter referred to as Instruction Manual) which is in the appendix and which presents the background data, the forms and procedures, the data inputs, and the computer programs outputs developed by the project to meet the specific objectives previosly listed.

Cost Estimation Model Development

The first task of the project team was to determine the "state of the art" in cost estimation methods and procedures used by the construction industry. This task involved the search of the literature (see Chapter II, "Guidelines for Facility Planning") and the review of the procedures used by architects and cost estimators in determining renovation costs and costs of expansion of educational facilities.

Most of the information available in the literature was concerned with estimating the cost of new

construction at the schematic drawing stage or at the detailed cost estimation stage based upon completed architectural drawings. It was decided by the project staff after discussions with architects and other facility planners that the cost estimation procedures at the schematic drawing stage could be modified and used in the Cost Estimation Model. Detailed descriptions of this cost information are given in the Instruction Manual for this section under the heading "Cost Estimation Model." Topics discussed in this section include background information on costs and the construction industry's cost estimation procedures for renovation.

Steps followed by architects, real estate appraisers and educational facility planners in determining the extent and cost of renovation of educational facilities are as follows:

1. Discuss the educational plans for anticipated use of the area in question with educational planners
2. Conduct a facility inspection to determine the adequacy of the plumbing, HVAC, electrical and general construction components
3. Determine the needed improvements based upon the educational specifications as developed by state guidelines and standards

4. Develop a preliminary cost estimate based upon the necessary changes to meet the future needs.

At this stage of estimation, the estimation error may range from plus or minus 15 percent. After this initial estimate is made, the school district then determines the feasibility of the project and hires the architect to develop detailed plans and to make a more detailed cost estimate of the renovation.

The Cost Estimation Model developed for this Project was patterned after this preliminary estimation procedure discussed above. In using this model, it is necessary to complete the forms in the School Building/Site Assessment Packet. The assessment of the facility and of the individual program room areas is then used by the inspector to determine the degree of renovation required by program area. The Building Inspector's Cost Analysis Report was developed to record these results. A complete description of this form is presented in the Instruction Manual.

To complete the cost estimation process it is necessary to code the data for input into the computer programs. Coding instructions and the data format are presented in the appendix in the Instruction Manual.

Validity and Reliability of the Cost Estimation Model

Validity refers to the instrument's ability to measure the concept in question and reliability refers to the consistency of measurement. Both of these instrument

characteristics were determined for the Cost Estimation Model.

Two forms of validity are important to the usefulness of this model. They are face and predictive validity. Face validity for the model was established by having architects, facility planners, and project staff review the definitions for minor and major renovation, the cost values for each of the major construction components (plumbing, HVAC, electrical, and general), and the formulas. Also, the instruments and procedures were reviewed by the internal advisory committee. Based on these inputs, modifications of the costs, procedures, and definitions were made. After final review of the procedure and instruments, it was determined that the Cost Estimation Model was a valid (face validity) tool for estimating renovation costs.

Predictive validity shows how well the method predicts the actual costs of renovation. Predictive validity was not established for this model. It was determined in discussions with architects that there was no economically feasible method for determining this form of validity. It would be necessary to inspect six or more schools, determine the renovation cost estimates and then actually have architects develop the detailed drawings and cost estimates. The estimated cost for this procedure was beyond the resources available to this project.

Reliability of the Cost Estimation Model was determined by having teams of inspectors visit the same facility. Each inspector completed the Building Inspector's Cost Analysis Report based upon his assessment of the facility. It was found that a very high correlation existed between the inspectors' reports on the degree of renovation needed. It was also determined by the project staff that consistent assessments and cost estimations can only be achieved by persons trained in the use of the School Building/Site Assessment Packet and the Building Inspector's Cost Analysis Report.

Computer Programs

There were two computer programs developed for the project to assist in the analysis of the data from the School Building/Site Assessment Packet and the Cost Estimation Model. The first program will generate the following output reports:

1. Comparison of acceptable facility criteria against actual facility data by each room area within a facility
2. Estimation of the renovation costs by program area and for additions needed
3. Total estimated costs of renovation for each program area by economic region
4. Average actual area (square footage) by program area for all buildings in data collection sample.

Complete descriptions of these output reports and the computer program listings are included in the Instruction Manual.

The second program was developed to provide summary reports for the building site recapitulation data from the School Building/Site Assessment Packet. The descriptive statistics developed for these overall ratings of the building and site are reported by economic region (see Instruction Manual for detailed description of this program).

Analysis of the information provided in the reports fr hese computer programs serves the needs of the specific objectives of the project as previously listed. These reports provide an assessment of the status of a sample of vocational facilities in Indiana and the relationship of existing facilities with standards and guidelines for vocational facilities as well as the accessibility of the facilities to the handicapped student.

In summary, it could be concluded that the Cost Estimation Model and the Computer Programs provide an effective information system for local and state educational decision makers.

CHAPTER VI

ON-SITE ASSESSMENT OF FACILITIES

After the development of a preliminary assessing instrument, of acceptable criteria for use in assessing vocational facilities, and of the Cost Estimation Model, it was necessary to test the instrument on actual facilities. As a result of field testing the instrument, the project staff made refinements to finalize the instrument into a usable tool. This chapter will include sections on population and sample selection, logistics and procedures for on-site inspections, and interpretation of the facility report.

Population and Sample

The population for this study was defined as all Indiana secondary school facilities offering vocational and/or technical programs approved by the State Board of Vocational Technical Education. A computer printout listing these secondary school facilities and each of their approved programs was obtained. From these printouts the project staff compiled a list of facilities according to type (e.g., area vocational schools, comprehensive and technical high schools, and comprehensive high schools) and the programs offered in each one. For each facility listed, an official county code number, an official institution number (school

corporation number), an official school building number, and the economic region in which it was located were provided.

From this master list, those facilities offering only one program were eliminated from the sample. The remaining 321 schools were listed on separate cards with the following information:

#1	Type of School:	Area vocational school Career center Technical high school Comprehensive high school
#2	Location in the State:	Marion County northeastern Indiana northwestern Indiana southern Indiana

A random sample, which later became the preliminary sample, was generated from these completed cards. Each of the selected facilities was placed on a list according to its geographic location in either Marion County, northeastern Indiana, northwestern Indiana, or southern Indiana.

This preliminary sample was then reduced to 40 facilities, which comprised a stratified random sample. The stratification resulted from the selection of a larger percentage of area vocational schools, career centers, and technical high schools from each geographic region. In other words, the stratified random sample over-represented area vocational schools, career centers, and technical high schools. The primary purpose for this decision was the project staff's desire to develop and test an instrument that would be usable on these special facilities.

Important to this study was the fact that in Indiana there are several large campus type facilities (e.g., Arsenal High School) which include several buildings and a multitude of courses in each program area (e.g., 54 courses listed in the area of trade and industry). Although the School Building/Site Assessment Packet was not designed for use in assessing this type of unusual facility, it may be adapted by completing the entire packet for each program area (e.g., home economics, health, trade and industry, special education, distributive education, business, and agriculture). Designing the assessment packet particularly for use in such unusual facilities would have resulted in making it unwieldy, more expensive, and perhaps not so suitable for use in more typical facilities.

The preliminary random sample was divided into a pilot study group and a primary group. The original intention was to use the pilot group to work out the "bugs" in the system and the primary group to test the data collection systems and computer systems (e.g., programming, printout, and summary analysis). What actually resulted was that all of the facilities, with the exception of the last 18 inspected, were in reality the pilot samples. This modification was necessitated by the numerous changes made in the assessment packet as the project progressed. The project staff unanimously agreed that the changes greatly added to the workability and validity of the assessment packet. Most

of the ensuing changes resulted from the advice and counsel of the internal advisory group which consisted of a variety of administrators and practitioners, including representatives from the Indiana State Advisory Council for Vocational Education, the Indiana State Vocational Technical Education Board, Schoolhouse Planning, the Vocational Education Department, superintendents, principals, vocational directors, and architects.

Throughout the progress of the project, data were collected from numerous facilities. However, because of the above mentioned changes in the assessment packet and data collection sheets, only the final 18 facility assessments included all of the necessary data in a format compatible with the final assessment packet. Many of the facilities on the list were inspected solely for the purpose of developing and testing the assessment packet. Several of the facilities inspected were revisited two or three times in order to obtain complete data compatible with the final instruments. Many facilities were revisited in order to compensate for the "learning curve" experience. The inspectors' performances became more accurate and consistent as they became more familiar with the educational programs and facilities. Therefore, the reinspections were valuable in revalidating previous data collected.

On-Site Assessment of Facilities

Site Inspection Logistics

In order to organize the site inspection effort, it was necessary to gain an overview of the geographic dispersion of the sample, the size of the facilities, and number of programs offered at each facility. Only after these factors were known could a schedule of site inspections be projected. The list of selected sites was reorganized by geographic region: Marion County, northwestern Indiana, southern Indiana, and northeastern Indiana. Within each region the facilities were further divided into the following categories: area vocational schools, career centers, technical high schools, and comprehensive high schools. The information on each facility listing included the following: map code number, facility name, street address, city, state, zip code, institution identification number, program areas offered, and number of courses within each program area. The listing sheets looked like the example below.

MARION COUNTY

Map Code	Area Vocational Schools	Institution Idenfication Number	Clusters/Courses
#1	Jones Area High School 10111 E. 37th Street Indianapolis, Indiana 47777 *(1-1,2 days)	5484	D.E.- 5 COE - 2 Ag - 10 Ind - 15 H.E.- 10 H - 1

*Under each listing was placed an estimate of on-site inspection time (e.g., area vocational high school: 1-1/2 days, career

center: 1-1/2 days, comprehensive high school: 1 day, etc). The on-site time estimate varied according to the nature of the facility (e.g., area vocational school), the number of program areas offered, and the number of courses in each program areas. For the above example 1-1/2 days was the estimate.

A map of the State of Indiana was divided into four regions: Marion County, northwestern Indiana, southern Indiana, and northeastern Indiana. Within each region, the various facilities were located and identified by code on the state map. Adjacent to each coding was inserted the estimated time necessary to inspect the facility. Once all of the facilities were placed on the map, clusters of schools located in the same general vicinity were identified (e.g., Rochester Community School and Culver Community High School). In order to minimize the travel time of the inspectors, clusters of schools in the same general vicinity were scheduled for assessment before the inspectors moved on to another geographic area.

Each of the administrators in facilities to be inspected was contacted by letter and informed of the project and its goals and objectives prior to the visitation. The administrator usually was notified by letter approximately one week in advance of the proposed date of inspection and was contacted by telephone the day before the actual on-site inspection. This advance communication greatly facilitated the on-site inspections by ensuring that the inspection team would have the assistance of building personnel in gathering information and conducting the assessment. Also

through this advance contact, the administrators were advised of the information that would be needed for the inspection, the parts of the facility which would be assessed, and the necessity of having a person available to assist the inspectors. Information needed from the administrator's records included student enrollment, geometric areas of the building and site, programs offered, room numbers, construction dates, a school plan layout, number of student stations, specific program information, problem areas, and other general information. Furthermore, a definite attempt was made to view all facilities during the school day. Viewing the facility while in use was of great assistance in assessing such things as flexibility, congestion, accessibility, and problem areas.

After the initial meeting with the administrator(s) at each facility, the inspection team was accompanied throughout the facility by a "guide," who was invaluable in locating the rooms and in providing general information. When possible without interrupting classroom activities, the inspectors attempted to converse briefly with the instructors assigned to the particular stations. These conversations were very helpful in identifying problem areas, facility deficiencies, facility strengths, flexibility, and detailed information regarding equipment and special accommodations. Most instructors were willing to talk with the inspectors once they realized that the information given would remain

confidential and that the inspectors were not an official agency. It was important for the inspectors to differentiate between real problems and general complaints as they talked with instructors. Most questions were directed specifically to obtaining information about the teaching stations. Inspectors spent approximately ten minutes noting such things as space allotments, maneuverability, accessibility, and certain specific use problem areas in rooms where classes were in session. They were careful not to interact with the students or distract them from their activities. All photos taken excluded human subjects.

In order to get a good overview of the entire facility, the inspectors visited most areas within it, giving special attention to energy efficiency measures, maintenance, sonic characteristics, lighting and electrical systems, surface treatments, and convenience accommodations (e.g., restrooms, water fountains, etc.). Special attention also was given to elevators, hallways, stairwells, doors, and restrooms and their suitability for use by handicapped students.

Upon completion of the inspection tour, the inspectors returned to the administrative offices to express appreciation for the time, consideration, and cooperation of the building personnel. It is very important to note that good rapport and communication with the administrators in each facility may very well have added to the completeness and accuracy of the data obtained during the inspections. The

inspectors developed this good rapport and kept open lines of communication by carefully informing administrators of the on-site activities of the inspection team and keeping a low profile during their visit.

After completing the facility inspections, the inspectors reviewed the entire site accommodations, giving special attention to accessibility to the grounds and facility, parking accommodations, association between buildings, and general neighborhood influences. Obvious problem areas such as noxious odors, traffic congestion, and industrial influence were noted. Before leaving an area, the inspectors contacted local real estate agents to gain an overview of the area and any significant trends taking place. They also attempted to obtain city maps, site maps, etc., available from county courthouses, chambers of commerce, and other sources.

Equipment and Supplies

Inspectors were equipped with the following items:

35 mm. camera with flash
100 ft. measuring tape with clip
25 ft. measuring tape
ruler (scaled/architect)
grid paper
clipboard
notepaper
film
assessment packets
extra inspection sheets
cost analysis forms
project information handouts
vocational education program/course listing summary
special equipment list

calculator
state and city maps
vocational school directory

Optional items included:

light meter
"wheel roller" measure
9 ft. carpenter's rule
engineering scaled ruler

Inspectors should be equipped properly for field/on-site inspections by carrying with them minimum office supplies in addition to the above listed items. Such office supplies include paper clips, stapler, file folders, pens, pencils, envelopes, business cards, scotch tape, etc. One must remember that these supplies are often not conveniently accessible to the field inspectors. The lack of proper equipment and supplies may result in obtaining inaccurate and/or incomplete data, as well as perhaps causing time consuming and expensive extra travel.

On the day of the inspection, inspectors were given the assessment packets with the sections on school name, address, city, computer coding, and type of facility (area vocational school, career center, etc.) already completed. In addition they were given an information page similar to the example below.

Jones Area Vocational School
Principal: John W. Doe
Superintendent: Frank W. Doe, Sr.
Person to contact: Frank W. Doe, Jr.
Vocational Director
Address: 2262 East 600 South
Indianapolis, IN

Directions: I-65 south to I-465.
I-465 east to 38th Street exit.
38th Street east to County Road 600 South.
Right at County Road 600 for 5 miles.
The vocational facility in on the left side.
The administrative offices are off the center entry.
Program areas and courses: DE-5, COE-2, Ag-10, Ind-15, HE-10, and H-1.

Appointment time: 7/1/78 (Wednesday) 9:00 a.m.

All of the above information is necessary to economize the inspector's time by eliminating the need to seek directions to the facility, search for a person who knows the facility, or gain proper authority to inspect.

Procedure for On-Site Assessment of Facilities

The discussion in the previous section of this chapter presents the basic procedures for arranging the schedules of the inspection teams, dealing with the school administrators, and equipping the inspectors properly. Below is a listing of events in the order which they logically might occur in an actual on-site assessment of a facility.

1. List all facilities by geographic region (e.g., Marion County, northwestern Indiana) and by type of facility (e.g., career center)
2. For each facility, list locational information, programs, courses offered by course number, map code identification, and computer identification information (e.g., building number, county, economic region)
3. Estimate inspection time for each facility

4. Locate each facility on a map with code number and time estimate for inspection
5. Note geographic clustering and sites for potential "doubling" of inspections in the same day
6. Set up inspection schedule by calendar day and approximate time according to the overall project time frame
7. Notify each administrator involved of the future inspection, including a project overview or handout, a request for that administrator's cooperation, an exact date and time for the assessment, and an outline of the information which will be needed (e.g., student enrollment, area of the site, etc.)
8. Telephone each administrator the day prior to the visitation to confirm the arrangements and directions to the facility
9. Provide the inspectors with the assessment packet, cost forms, and facility information sheet (address, directions, and person to contact)
10. Report to the administrator's office immediately upon arrival at the site
11. Meet with the administrator(s) of the facility to answer any questions which may arise
12. Inspect all parts of the vocational educational facility with the guide provided by the administration, keeping in mind that viewing the stations

in use and interacting with the instructors and building personnel will provide useful information

13. Complete the inspection sheet for all parts of each vocational education facility
14. Inspect the mechanical and support systems, convenience accommodations, the building in general, and the surrounding accommodations such as recreation areas, parking areas, and grounds in general
15. Report the completion of the assessment tour to the administrator(s)
16. Report the overall orientation and association of ground, facilities, and surrounding areas
17. Complete assessment packet, cost forms, and shoot the required site photographs
18. Contact local sources for necessary information such as maps, general neighborhood information, and area trends
19. Submit completed reports upon return to the base of operation.

It is of utmost importance that the inspectors possess a working knowledge of the instruction manual for the School Building/Site Assessment Packet for Vocational Education Facilities and the instruction manual for the Cost Estimation Model and Computer Programs prior to any assessment attempt. Improper or incomplete use of the assessment packet and Cost

Estimation Model by inspectors may result in the collection of inaccurate or insufficient data and thus distort the final assessment results.

The Appendix for Chapter VI contains an example of a properly completed assessment and cost estimation packet. This example consists of maps, completed forms, photographs of facilities, and other such information about programs offered by vocational facilities. The discussion of what uses may be made of data contained in the sample assessment and cost estimation packet follows in the next section.

Implications and Uses of the Facility Assessment and Cost Estimation Packet

The overall assessment of a vocational education facility based on criteria compiled from experts by the project staff provides the basis for a subjective determination of the facility adequacy. A more detailed analysis of each station within the vocational facility to show how it compares with the acceptable criteria set forth by the project staff follows the more general overall assessment.

The results of the comparisons of data collected during an assessment with the standard criteria developed by the project staff are then converted to an estimation figure of the cost to renovate the facility to meet accepted standards if such a direction is indicated. To assist the decision makers at either the local or state level concerning the intepretation of the assessment or cost analysis, the

collection of such material as facility and site photographs showing certain inadequacies such as lack of ramps or improper electrical systems, maps of the local and/or county areas to show location of the facility in relationship to the location of other vocational facilities, or undesirable features such as a railroad in close proximity or poor accessibility to the facility is a part of the completion of the total assessment packet.

An educational decision maker should review all aspects of the assessment packet (e.g., the cost analysis, the station by station comparisons of actual data with acceptable standards, and the site accessibility information) in the process of deciding whether or not to undertake a study to determine the feasibility of a renovation.

The assessment and cost estimation information gathered may also be used by state level officials in determining vocational facility needs in a given geographic area of the state. Such data would also would be useful should local school officials decide to seek federal money for the purpose of renovating their vocational facility according to the documented needs provided by the assessment and cost estimation packet.

CHAPTER VII

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

The thrust of the project was to develop instruments and procedures for evaluating and assessing the status of facilities for accommodating secondary school vocational programs in Indiana. The School Building/Site Assessment Packet, Cost Estimation Model, Computer Program, and facility reports represent the products of the study. As would be expected in carrying through a project so extensive as this one, certain things were discovered and learned from which rather conclusive positions could be drawn. This chapter reports the findings and conclusions and sets forth a number of recommendations for the Indiana State Advisory Council for Vocational Education to consider.

Findings

Many things were discovered as the project was being carried out. Reported in this section are those findings perceived as pertinent.

1. An extensive review of the literature revealed that a great deal of the information available in the field of vocational education was very general in nature

2. In searching for definitive ideas to use in facility planning, it was found that there were many general guidelines and relatively few specific standards
3. In reviewing literature dealing with the design of facilities to accommodate handicapped people, specific standards were suggested
4. Existing instruments for school facility assessments were found not to be applicable in some instances and not sufficiently detailed in other instances
5. A search of the contemporary literature relating to school facilities revealed that much attention was being given to energy problems
6. No procedures were found to exist for doing cost estimation for facility renovations, although procedures to apply to estimate costs of new construction were available
7. Regulations and standards available for school buildings in Indiana applied primarily to general construction requirements, health, and safety, with the educational requirements being mainly for elementary and secondary school room sizes
8. The literature search revealed that limited information was available on reasonably sophisticated approaches being used to project vocational education facility needs for the future

9. The modified Delphi technique used in this project did yield consensus on acceptable criteria to use in projecting facility needs for vocational education in Indiana
10. Training and experience in using the School Building/Site Assessment Packet minimizes errors and improves efficiency
11. The assessment packet does measure and judge criteria that were established by Indiana state agencies and suggested by the modified Delphi study for determining adequacy of secondary school vocational facilities
12. The School Building/Site Assessment Packet does have face validity
13. The assessment packet is useful for assessing facilities other than those classified as secondary school vocational facilities
14. The assessment packet can be used by different trained evaluators and produce similar results
15. The Cost Estimation Model is a desirable tool to use in vocational facility planning
16. Time, location, and extent of renovation are three variables that greatly influence cost estimation
17. The Cost Estimation Model cannot be used to generate exact and precise costs

18. The use of the Cost Estimation Model depends on the complete and accurate application of the School Building/Site Assessment Packet
19. No predictive validity was established for the Cost Estimation Model because there is no feasible way to establish it
20. It is not essential or efficient to computerize all data recorded in the assessment packet
21. It is feasible to generate a variety of data summaries by computer programs
22. Efficiency in using the assessment packet is improved in situations where basic facility information (e.g., blue prints, floor plans, cost data) exist and are readily available
23. Time to complete the assessment packet varies between two hours and two days, depending on size of facility and number of vocational programs
24. Specific subject variations within schools cause some problems in the identification of program area (cluster) for facility assessment
25. Helpful information can be obtained from local personnel (e.g., students, teachers, directors), however, the information needs to be carefully scrutinized.

Conclusions

Based on the findings and observations, certain things could be inferred. This section lists the major conclusions drawn by the project team.

1. There is not available and/or conveniently accessible, information for facility specialists, architects, cost analysts, and other planners to use for preplanning, designing, estimating, and projecting vocational facility needs
2. Reasonable standards are needed along with guidelines to assist in vocational education facility planning
3. The efforts underway in Indiana to compile and communicate building and site regulations for school facilities from various state agencies (e.g., Administration Building Council, Fire Marshall, State Board of Health) will be helpful for facility planning
4. The modified Delphi technique is a good procedure to use to help generate vocational facility standards and guidelines for the future
5. If a uniform system of subject identification with program area is used, it simplifies application of the facility assessment packet
6. Application of the assessment packet and Cost Estimation Model requires some special training of personnel who will use these tools

7. The assessment packet and Cost Estimation Model are useful tools in a management information system (MIS) for generating pertinent facility and cost estimation data
8. The assessment packet is a useful instrument to use in planning as well as in evaluating facilities
9. Information generated from the assessment packet and Cost Estimation Model will be helpful to vocational planners at all levels (local, state, regional, federal)
10. The tools developed in this project could prove useful in coordinating and communicating vocational education facilities status and future needs to all state agencies involved in vocational program development and implementation.

Recommendations

The members of the project team fully recognize that the use of the information and products produced by the project rests with the Indiana State Advisory Council for Vocational Education. However, six recommendations are being posed for their consideration:

1. It is recommended that the Indiana Advisory Council for Vocational Education work with other agencies in operationalizing and implementing the use of the assessment packet and Cost

Estimation Model for assessing and evaluating the status and needs of vocational education facilities in Indiana

2. It is recommended that a series of activities be undertaken to communicate the nature, availability, and potential use of the assessment packet, Cost Estimation Model, and Computer Programs
3. It is recommended that workshops be setup to train personnel (e.g., vocational directors, facility planners, architects, programmers) in how to use the products of the project
4. It is recommended that cooperative state efforts be undertaken to complete a total assessment of all facilities used for vocational education programs in Indiana
5. It is recommended that Indiana state agencies with vocational education functions and interests (e.g., State Advisory Council, State Board of Vocational Education, Department of Public Instruction) dissemimate the products of this project for potential use nationally
6. It is recommended that the Indiana State Advisory Council for Vocational Education plan to reevaluate, update, and refine the products developed in this project.

Summary

The primary objective of the project was to develop and test tools, procedures, and techniques to use for evaluating and assessing facilities for secondary vocational education programs in Indiana. The five specific objectives of the project are stated in Chapter I. This final report, including the appendices and individual facility reports, meets the objectives set forth for the project.

BIBLIOGRAPHY

BIBLIOGRAPHY

1. Adequate space requirements and student capacity recommended for vocational and technical education programs. Baltimore, Maryland: Maryland State Department of Education, Division of Vocational-Technical Education, 5 p.

2. A guide to preparing educational specifications for secondary industrial arts facilities. Charleston, West Virginia: American Council of Industrial Arts Supervisors, 1974, 36 p.

3. American national standard specification for making buildings and facilities accessible to and usable by, the physically handicapped. New York, New York: American National Standards Institute, 1961, 11 p.

4. ASHRAE standard: Energy conservation in new building design. New York, New York: The American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 1975, 53 p.

5. An approach to the design of the luminous environment. Albany, New York: State University Construction Fund, 1976, 122 p.

6. Barrier-free school facilities for handicapped students. Arlington, Virginia: Education Research Service, Inc., 1977, 88 p.

7. Biddle, James W. (Ed.). Functional space planning guide for vocational-technical education programs in secondary schools. Indianapolis, Indiana: State of Indiana Department of Public Instruction, Division of Vocational Education, 1977, 126 p.

8. Building and equipment for teaching vocational agriculture and standards for conducting such programs in Washington State. Olympia, Washington: State of Washington Department of Public Instruction, Coordinating Council for Occupational Education, 1975, pp. 35-152.

9. Career cluster facilities guide. Salem, Oregon: The Oregon Board of Education, 1973, 59 p.

10. Career education facilities. New York, New York: Educational Facilities Laboratories, 1973, 47 p.

11. Castaldi, Basil. Education facilities: Planning, remodeling, and management. Boston, Massachusetts: Allyn and Bacon, Inc., 1977, pp. 222-260.

12. Cotter, Stephen R., & DeGraff, Alfred H. Architectural accessibility for the disabled of college campuses. Albany, New York: State University Construction Fund, 1976, 133 p.

13. Distributive education classroom and laboratory. Olympia, Washington: Washington Department of Public Instruction, 3 p.

14. Distributive education laboratory and school store layouts. New York, New York: Selrite School Equipment Corp., 26 p.

15. Estimated space requirements and equipment costs for various agricultural education facilities. Columbus, Ohio: State of Ohio Department of Education, 7 p.

16. Facility and curriculum guidelines for high school trade and industrial education: Program auto body and fender. Olympia, Washington: Washington Department of Public Instruction, 28 p.

17. Facilities needed to establish agricultural courses based on an enrollment 20 students per section. Albany, New York: The University of the State of New York, The State Education Department, Division of Occupational Education, Bureau of Agricultural Education, 1973, 3 p.

18. Facilities for teaching home economics-homemaking and family living education. Albany, New York: The University of the State of New York, The State Department of Education, Division of Occupational Education, Bureau of Home Economics Education, 1973, 7 p.

19. Gill, W. B., & Like, A. W. Facilities handbook for career education. Washington, D.C.: National Institute of Education Papers in Education and Work (No. 2), U. S. Office of Education, 1976, 230 p.

20. Guidelines and space requirements for the Groton Regional Vocational-Technical School - Groton, Connecticut. Hartford, Connecticut: The Connecticut State Department of Education, Division of Vocational Education, Office of Buildings Facilities Planning, 1972, 43 p.

21. Gwynn, Susan K. (Ed.). Guide for planning educational facilities. Columbus, Ohio: The Council of Educational Facility Planners, International, 1976, pp. I 1 - I 11.

22. Handbook on planning school facilities. Charleston, West Virginia: West Virginia Department of Education, 1973.

23. Health occupations education program development guide no. 3: Health services. Albany, New York: The University of the State of New York, The State Education Department, Division of Occupational Education Instruction, Bureau of Health Occupations Education, 1971, pp. 6-17.

24. Health occupations education program development guide no. 4: Home health assisting. Albany, New York: The University of the State of New York, The State Education Department, Division of Occupational Education Instruction, Bureau of Health Occupations Education and Bureau of Home Economics Education, 1975, pp. 10-18.

25. Health occupations education program development guide no. 5: Dental assisting. Albany, New York: The University of the State of New York, The State Education Department, Bureau of Health Occupations Education, 1972, pp. 8-10.

26. Health occupations education program development guide no. 6: Medical assisting. Albany, New York: The University of the State of New York, The State Education Department, Division of Occupational Education Instruction, Bureau of Health Occupations Education, 1971, pp. 31-36.

27. Health occupations education program development guide no. 11: School health assisting. Albany, New York: The University of the State of New York, The State Department of Education, Division of Occupational Education Instruction, Bureau of Health Occupations Education, 1974, pp. 21-24.

28. Health services training guide. Albany, New York: The University of the State of New York, The State Education Department, Bureau of Secondary Curriculum Development, 1968, pp. 5-6.

29. Housing and equipment for agricultural education. Sacramento, California: California State Department of Education, Bureau of Agricultural Education, 1958, 39 p.

30. Industrial arts facility planning: A guide. Albany, New York: The University of the State of New York, Bureau of Educational Plant Planning/Bureau of Industrial Arts Education, 1976, 23 p.

31. Instruments and procedures for the evaluation of vocational/technical education. Washington, D.C.: National Study for Accreditation of Vocational/Technical Education, American Vocational Association, 1971, pp. 81-83; 122-123.

32. Kliment, Stephen A. Into the mainstream: A syllabus for a barrier-free environment. Washington, D.C.: American Institute of Architects and the Rehabilitation Services Administration of the Department of Health, Education, and Welfare, 1976, 44 p.

33. Lisk, Kenneth E. (Ed.). Business and office education facility and equipment standards. Olympia, Washington: Washington Department of Public Instruction, 1976, 5 p.

34. A list of suggested equipment for a course in agricultural mechanization. Albany, New York: The University of the State of New York, Division of General Occupational Education, Bureau of Agricultural Education, 1967, 11 p.

35. Manual for planning and construction of school buildings Concord, New Hampshire: State of New Hampshire Department of Education, 1975, pp. 52-60.

36. McDonald, Kenneth, & Robertson, Garret R. Guidelines for power sewing facilities. Olympia, Washington: State of Washington, Coordinating Council for Occupational Education, Home and Family Life Section, State Department of Public Instruction, 1974, 38 p.

37. Modern school shop planning (7th ed.). Ann Arbor, Michigan: Prakken Publications, Inc., 1976, 314 p.

38. One out of ten: School planning for the handicapped. New York: Educational Facilities Laboratories, 1974, 24 p.

39. A pictorial guide to aid in planning business and distributive education classrooms and facilities. Albany, New York: The University of the State of New York, The State Department of Education, Bureau of Business and Distributive Education, 1965, 45 p.

40. Places and spaces for learning. Columbia, South Carolina: South Carolina Department of Education, Curriculum Development Section, 29 p.

41. Planning educational environments. Montpelier, Vermont: State of Vermont Department of Education, 1972, pp. 25-31, 33-35, 43-45.

42. Planning and equipping business educational classrooms. Sacramento, California: California State Department of Education, the Bureau of Business Education, 1961, 33 p.

43. Planning guide for construction of high school vocational facilities. Atlanta, Georgia: Georgia Department of Education, 10 p.

44. Planning occupational education facilities. Lansing, Michigan: Michigan Department of Education, 1973, 19 p.

45. Prindle, Frances, & Haas, Phyllis. Guidelines for planning child development laboratories. Olympia, Washington: State of Washington, Coordinating Council for Occupational Education, Superintendent of Public Instruction, Vocational Education, Home and Family Life Section, 1974, 68 p.

46. Procedure to be followed in schoolhouse planning. Indianapolis, Indiana: State of Indiana Department of Public Instruction, Division of Schoolhouse Planning, pp. 3-5.

47. Program evaluation for accounting and computing. Charleston, West Virginia: West Virginia Department of Education, Bureau of Vocational, Technical and Adult Education, pp. 8-9.

48. Program evaluation for cooperative vocational education programs. Charleston, West Virginia: West Virginia Department of Education, Bureau of Vocational, Technical, and Adult Education, pp. 8-9.

49. Program evaluation for stenographic-secretarial curriculum. Charleston, West Virginia: West Virginia Department of Education, Bureau of Vocational, Technical, and Adult Education, pp. 8-9.

50. Program evaluation for comprehensive home economics. Charleston, West Virginia: West Virginia Department of Education, Bureau of Vocational, Technical, and Adult Education, pp. 8-9.

51. Program evaluation for practical nursing. Charleston, West Virginia: West Virginial Department of Education, Bureau of Vocational, Technical, and Adult Education, pp. 8-9.

52. Program evaluation for welding. Charleston, West Virginia: West Virginia Department of Education, Bureau of Vocational, Technical, and Adult Education, pp. 8-9.

53. Program evaluation for agricultural production. Charleston, West Virginia: West Virginia Department of Education, Bureau of Vocational, Technical, and Adult Education, pp. 8-9.

54. Program evaluation for electronics technology. Charleston, West Virginia: West Virginia Department of Education, Bureau of Vocational, Technical, and Adult Education, pp. 8-9.

55. Program standards for vocational distributive education in the secondary schools: A checklist. Phoenix, Arizona: Arizona Department of Education, Division of Career of Vocational Education, 8 p.

56. Program standards for the preparation of nursing and allied health practitioners: A checklist. Phoenix, Arizona: Arizona Department of Education, Division of Career of Vocational Education, 8 p.

57. Program standards for secondary health occupations education: A checklist. Phoenix, Arizona: Arizona Department of Education, Division of Career of Vocational Education, 4 p.

58. Program standards for postsecondary vocational education in business and office education: A checklist. Phoenix, Arizona: Arizona Department of Education, Division of Career of Vocational Education, 3 p.

59. Safety compliance manual: Guide for administrators and instructors. Terre Haute, Indiana: Indiana State University, Indiana Currciulum Material Center, 1976, Sec. 2, pp. 13-22.

60. School sites: Selection, development, and utilization. Trenton, New Jersey: New Jersey State Department of Education, Division of Field Services, 1973, 24 p.

61. Educational specifications. Trenton, New Jersey: New Jersey State Department of Education, Division of Field Services, 1973, 19 p.

62. Space and equipment recommendations for home and family life education programs-secondary and post secondary levels. Olympia, Washington: State of Washington, State Division of Vocational Education, Home and Family Life Section, 1967, pp. 11-17.

63. Standard VI - physical facilities, a self study evaluation instruction. Frankfort, Kentucky: Commonwealth of Kentucky Department of Education, 8 p.

64. Standards for quality vocational programs in agricultural/agribusiness education. Ames, Iowa: Iowa State University, Agricultural Education Department, 1977.

65. State plan for vocational education (excerpts pertaining to physical facilities). Frankfort, Kentucky: Commonwealth of Kentucky Department of Education, 1976.

66. Suggestions for the all-purpose home economics laboratory. Lincoln, Nebraska: Nebraska Department of Education, 3 p.

67. Vander Griend, Maurine, & Price, Cora N. Space and equipment for homemaking education in California high schools. Sacramento, California: California State Department of Education, Bureau of Homemaking Education, 1964, 64 p.

68. Vocation-technical education building facilities AVTS-V. Harrisburg, Pennsylvania: Pennsylvania Department of Education, Bureau of Vocational Education, 1975, 46 p.

69. Woodward, Robert L., & Meyers, Norman L. Planning and equipping industrial arts facilities (2nd ed.). Sacramento, California: California State Department of Education, 1971, 57 p.

70. You and vocational education. Indianapolis, Indiana: Department of Public Instruction, Division of Vocational Education, 1976, 26 p.

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